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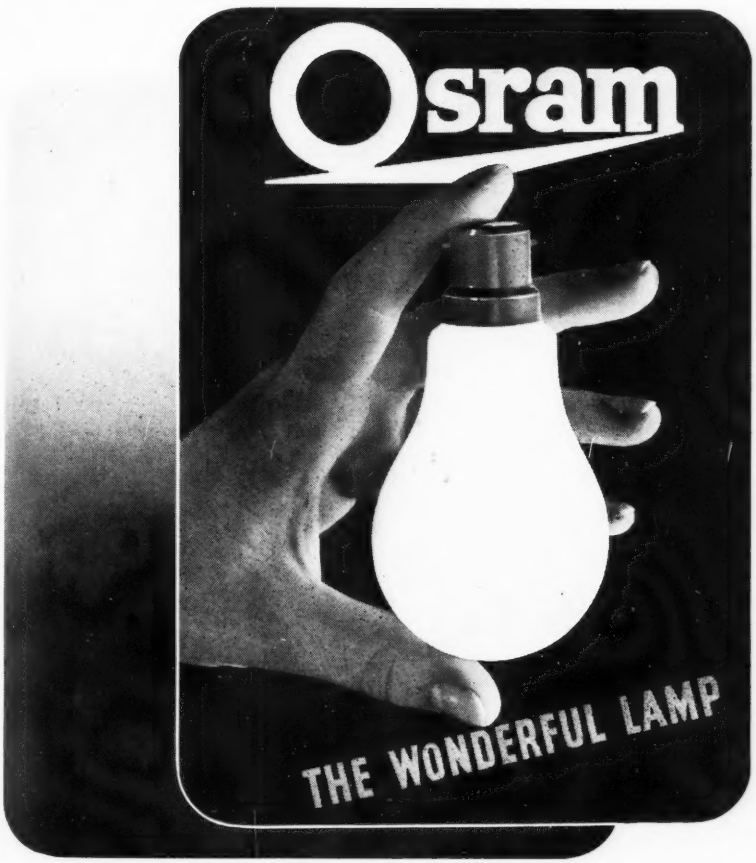

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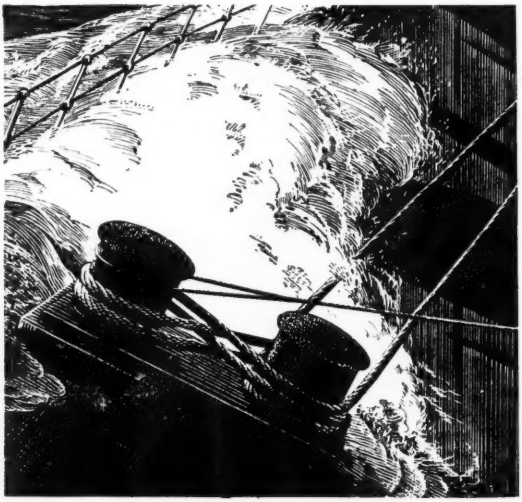

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October 22, 1943

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Technical Editor:
C. O. Brettelle, M.I.E.E.

Commercial Editor:
J. H. Cosens

Contents :—

	Page
Editorial—Gas-Electric "Truce"	527
Work of E.D.A.	530
Wire-Rod Rolling	531
New Books	535
Bonus on Quality. By A. S. Wharton, F.S.S., A.I.I.A.	536
Auto-Reclose Breakers	538
Electrical Fires. By S. F. Barclay, D.Sc., M.Inst.C.E., A.M.I.E.E.	539
Coal Conservation	541
Safety in Mines	542
Boiler Efficiency	543
Radio Silver Jubilee	544
Personal and Social	545

Contents continued :—

	Page
Correspondence	547
Sydney Council's System	548
E.P.E.A. Reorganisation Plan	549
Practical Education	550
Commerce and Industry	551
Recent Introductions	554
Electricity Supply	555
Financial	557
New Patents	561
Contract Information	562
Classified Advertisements	65
Index to Advertisers	76

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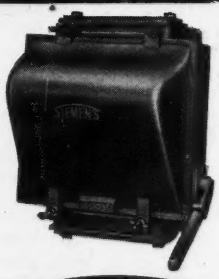

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIII. No. 3439. OCTOBER 22, 1943 6d. WEEKLY

Gas-Electric "Truce"

A Necessity with Little Virtue

THERE is an idea in some Government circles that the co-ordination, or even amalgamation, of the gas and electricity supply industries would be a very desirable move. They point to what they profess to believe is the very satisfactory wartime truce between the two and ask why this should not be continued after the war or extended into something much more binding. Is there any justification for this idea and this vision of future wedded bliss?

It cannot be denied that the conditions which have arisen during the war have compelled the two industries to hold off from one another. For one thing, the scarcity of labour, materials and appliances has made it impossible to do much more than endeavour to maintain existing installations. When it is impossible to extend these there is little chance of the two parties poaching on one another's preserves.

Enforced Economy

Because of this, advocates of co-operation may claim that the truce has resulted in economy of labour and materials (some of them have done so), but the saving must have been made in any case. All that has happened is stagnation in the "non-essential" fields and anyone can save energy and wear and tear by standing still.

But stagnation is eventually fatal; it means retrogression and decay. The existence of two live alternative means of performing a number of services has prevented lethargy in the past. More than that, it was largely responsible for the progress which both gas and electricity had made up to the beginning of the war. Each provided an incentive to the other. By what measure would a combined industry be judged?

From what we have heard from both gas and electricity supply undertakings the "truce" has been accepted as a necessary wartime restriction, but only as a restriction. They cannot see that it has much virtue, apart from symbolising national unity in a time of stress, and they consider that it should end with the war.

Gradual Withdrawal

It cannot, of course, end as quickly as that, for the conditions which force its observance will persist for some time after the war. It is clear, however, that if political and other interests do not prevent it there will be a gradual withdrawal from the truce as the supply position improves.

In the foregoing nothing has been said regarding the public's attitude to this question. To-day thousands of people are asking why they cannot have electricity or (misguidedly perhaps) gas. They are told "There's a war on" and that, of course, is a sufficient answer now. But afterwards they will not be satisfied for ever with the excuse "There has been a war on." They may submit to control when they are convinced of its necessity but it will be difficult to persuade them that the war has proved the undesirability of permitting them a free choice between

gas and electricity. It is strongly to be hoped that these considerations will be given due weight by those who would like to convert the truce into an uneasy partnership.

Gas Pressure

A STRANGE sidelight is thrown on the truce by a paragraph in an interim report just issued by E.D.A. Reference is made to a circular letter sent to local fuel overseers in the North-West Area by the British Commercial Gas Association drawing their attention to an extract from a report of the Select Committee on National Expenditure dealing with "priority of economies." The matter was brought by E.D.A. to the notice of the Ministry of Fuel and Power which promptly administered a snub to the B.C.G.A. by telling the local overseers to pay no attention to this or any similar circular issued by a sectional interest, as "the Ministry cannot countenance efforts on the part of a commercial association to exploit certain industrial interests."

Restoration of Services

WHILE the changing over of existing services from gas to electricity, or the other way round, is forbidden, except in very special circumstances, this does not mean that when it becomes necessary to restore services in bomb-damaged premises the original methods must be followed. An Order made by the Ministry of Health seemed to indicate otherwise but in response to a letter from E.D.A. the Ministry makes it clear that the matter is left to the discretion of the local authorities—and, we hope, to the desires of the tenants.

State Control

IN his address as president of the Institute of Transport last week, Sir William Wood, president of the L.M.S. Railway Co., strongly deprecated a statement by "a prominent member of the Government" that it would be wise to bring transport under public ownership in order to ensure the maximum and most efficient service. Sir William's comment upon this may have a wider application:—"Surely the proper course is to consider the merits of what has been provided by private enterprise, to inquire whether it has fallen short of public needs and, if so, in what ways, and then whether the responsibility rests with its owners or with Parliament."

The Dnieper Dam

WHEN the Russians had to fall back from the Dnieper in 1941, they destroyed the dam across the river which was part of one of the biggest hydro-electric plants in the world. Last week the Germans, who were forced to abandon the near-by town of Zaporozhe, announced that before withdrawing they had blown up the great river dam. The enemy reported last January that they had repaired the damage done to it by the Russians and it seems, therefore, that the restoration of the dam by our Allies may not be the very lengthy undertaking which was at first supposed. Nothing is known of the fate of the generating plant.

Back-Pressure Sets

As large works become more intensively electrified, it becomes less safe than ever it was to assume that some of the largest loads will automatically be connected to the public mains. Mr. T. E. Houghton's address to the Liverpool Centre of the I.E.E. puts up a good technical case for private generation where process steam is a primary requirement or where a heavy high-load-factor consumption would make feasible the construction of a generating station of a capacity comparable with that needed to serve a large town.

Private Plants

So many variable factors have to be taken into account in assessing the overall economics of back-pressure plant that, as Mr. Houghton says, each case must be treated on its merits. His claims are sufficiently well-based to keep supply engineers "on their toes" without the contention (which is at least open to argument) that private generation entails a lower expenditure on stand-by capacity. The extension of the use of back-pressure steam to district heating introduces new and distinct problems and its claims should be investigated separately.

Fuel Statistics

ALTHOUGH coal forms so substantial a proportion of our basic national wealth, there is still little data available regarding the proportion of our diminishing total resources that can be economically mined and prepared. Far more detailed knowledge is necessary before the coal industry can adopt the suggestion made by Dr. E. S. Grumell in his Melchett Lecture that it should collaborate with manufac-

turers in ascertaining what appliances can be designed to suit the types of coal that can be efficiently brought to the surface. In the circumstances Dr. Grumell surely was not asking too much of the Ministry of Fuel when he suggested that £10 million out of more than £20 million saved through the fuel economy campaign should be earmarked for fuel research.

Coal Utilisation

A complementary aspect is the need for knowledge of the purposes for which coal is used. Particulars of tonnages supplied in bulk to various industries give little indication, and few industries are so advanced statistically as that of electricity supply in this respect. In the importance he attached to the study of fuel in relation to the heat, light and power requirements of the community, Dr. E. V. Smith showed himself, in his presidential address to the Institute of Fuel, to be in accord with Dr. Grumell. Dr. Smith also expressed the view that the time is not yet ripe for integrating the coal, electricity and gas industries in a national fuel policy; each of them has many problems of its own to settle first.

Boiler Availability

FUEL saving as a consequence of increasing the steaming hours of boilers in commission is among the matters referred to by Mr. C. T. S. Arnett in his chairman's address to the I.E.E. North-Western Centre. Any improvement in reliability enables the most efficient units to carry a greater proportion of the output and also makes for a greater economy of all the boilers on load. Deposits are the great bugbear, but investigations of the Boiler Availability Committee (which already has water-lancing and steam-soaking of heating surfaces to its credit) indicate that modifications in the methods of supplying air under the grate may considerably mitigate their baneful effects. The merits of air heaters are such that Mr. Arnett's expression of confidence that fouling and corrosion difficulties will be overcome is very gratifying.

Commons Debate

THE debate in the House of Commons on the production of the greatest of our raw materials—coal—gave Ministers and private members a further opportunity of airing their views but left things much as they were before. The Prime Minister did not consider that a revolutionary change in the control of the industry could be thought of at the present time. One thing is certain ; there will be little if any margin between production and consumption, for the demand continues to grow. There can consequently be no slackening of efforts to secure the utmost economy of use. As both industrial and domestic consumers, our readers should again scrutinise their fuel arrangements very closely to enable every pound possible to be saved. In any event fuel economy is to be pursued at all times; it is one manifestation of general efficiency and it saves money.

Accessories

SIMPLIFICATION and standardisation of design without prejudice to functional details was prescribed by Mr. A. G. Ramsey, the new chairman of the I.E.E. Installations Section, as the chief means by which installation costs of the future could be kept at a pre-war level or possibly lower. His address was constructively critical of past methods and of the unnecessary variety of fittings produced (but surely not in response to demand !). One of the many recommendations he made was that only AC apparatus should be made as standard, DC being regarded as "special." Another was for an extended use of microswitches. To implement Mr. Ramsey's practical suggestions will call for close liaison between manufacturers of cables and accessories and installation engineers, such as it is the aim of the Section to provide.

The Factories

PROBABLY the most important deduction to be drawn from Mr. H. W. Swann's memorandum on electrical accidents in 1942, reviewed by us last week, is that production, as well as freedom from accidents, depends upon a sound electrical installation. This implies periodical maintenance by skilled men with the main object of preventing breakdowns, especially in view of the greater fire and explosion hazards that accompany many newer industries. The increasing scarcity of qualified maintenance electricians has led Mr. Swann, the Senior Electrical Inspector of Factories, to urge that the allocation of electrical labour should be in the hands of those having the requisite experience for dealing with what he reports is an ever-increasing difficulty.

Work of E.D.A.

A Review of Recent Activities

FOLLOWING the interim report on the work of the British Electrical Development Association for the months of April-May this year, the Council has presented a further report for June, July and August. This shows a continuation of the activities already reported. The national advertising scheme commenced in July and subsequently a series of local advertisements was issued.

Fuel economy, "domestic front," and post-war housing exhibitions have been held in various parts of the country, for which the Association has provided photographs and display material, and in some cases, complete plans. In addition to these activities advice and help has been given to various Government Departments.

New Films

The shooting script of the fuel economy film "Too Easy" is now complete and preliminary scripts are ready for review by the Publicity Advisory Committee for the films "Canteen Cooking" and "Post-War Housing." The preliminary work in connection with the film dealing with the electricity supply industry's contribution to the war effort is progressing. The abridged version of the C.E.B. film "Power and Electricity" has been completed and the loan of E.D.A. films to schools, institutions, etc., continues to increase.

Some 2,000 Ministry of Information window displays have been issued, and the Ministry of Food "Rat Destruction" display is now being sent to more than 100 showrooms in the London area. The E.D.A. window display library scheme in the North-West England Area has been reorganised and special displays have been designed for a number of undertakings.

Domestic Science Training

The E.D.A.-E.A.W. conference for senior demonstrators held on September 8th and 9th proved very successful, enrolments exceeding pre-war figures. With regard to domestic science training colleges, particulars of equipment installed and suggestions for additional equipment have been sent to the engineer of the Battersea Polytechnic and reports have been prepared on the well-equipped Glasgow and Leicester Domestic Science Colleges.

The Association's evidence on the design of electrical equipment of houses and flats has been circulated to leading architects and housing directors, and further progress has been made in the design of wiring installations and arrangements for the supply of suitable appliances for Coventry houses.

In the field of appliance design the Area Committees have considered proposals for the interchangeability of cooker parts and the design of a new type of electric pasteuriser has been discussed with manufacturers, including the conversion of existing types to electric heating. Discussions have also taken place with the Ministry of Fuel and Board of Trade with a view to improving the supply of utensils for use on electric cookers.

Contact has been made with various planning authorities and officers on post-war planning and housing, and area conferences and meetings dealing with this aspect have been held in a number of cities and in the provinces. Contact has also been established with about 200 architects and proposals will shortly be issued providing for closer co-operation between representatives of E.D.A. Area Committees and local Architects' Chapters. Discussions are also taking place with a view to the establishment of closer liaison between the Architectural Association and E.D.A., particularly in regard to the provision of specialist lectures in connection with the A.A. Schools' post-war programme.

Lighting and Welding

Considerable attention is being given to immediate post-war lighting, and negotiations have been opened with E.L.M.A. with a view to the production of a publication for circulation to local authorities.

The important question of electric welding tariffs is also under discussion and a sub-committee of the Greater London Area Committee, under the chairmanship of Mr. J. D. Spark, is considering making recommendations on appropriate forms of tariffs for such installations. Contact is being maintained with the Electricity Commissioners in connection with technical investigations now being carried out at their request by the E.R.A. Information is being collected regarding methods of charge.

In addition to the foregoing activities an enormous amount of work has been done by the Information Bureau and the Association continues to take a leading part in the work of Electrical Industries Red Cross Appeal and the Electrical Industry Waste Paper Recovery Committee.

An advertising campaign by the Electric Vehicle Association is in progress and members are being kept informed of interesting developments.

Wire-Rod Rolling

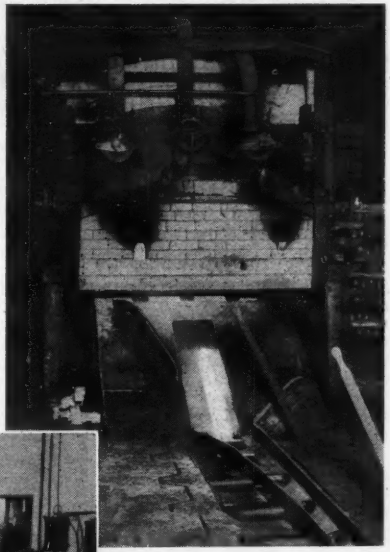
Processes in the Production of Important Electrical Material

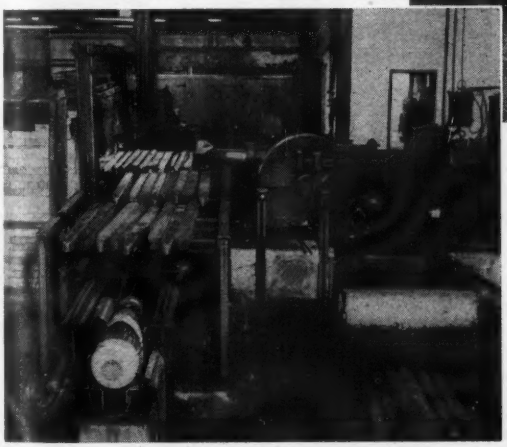
THE article on "Copper Refining" in the *Electrical Review* of April 2nd last described the processes as we saw them in an up-to-date refinery, and it will be recalled that the products of the installation are bars measuring 50 in. long and 4 in. by 4¼ in. in section. We now deal with the conversion of these bars into wire-rod which serves mainly as the raw material for the wire-drawing works.

The rod is hot rolled in a sequence of operations on the continuous-flow principle with only one initial heating of the refinery bars to 1,660 deg. F. in a suitable furnace to which the bars are transported on bogies on a narrow-gauge railway. The furnace is of the push-through type and the feeding equipment includes a moving table which runs on rails to and fro in a line at right angles to the furnace-flow line. At one end of its run the table is crane loaded with the bars in packs of twelve, the bars being so arranged on the table that the 4¼-in. and 4-in. faces are uppermost alternately.

As required, the table is driven to a point at which a pack of rods is between, and in line with, the furnace door and the ram of the pusher feeding equipment. At this point the pack of bars can be similarly dealt with, and finally it is brought back to its original position for reloading.

The table is driven by a 3-HP motor at one end of the stationary base, with transmission





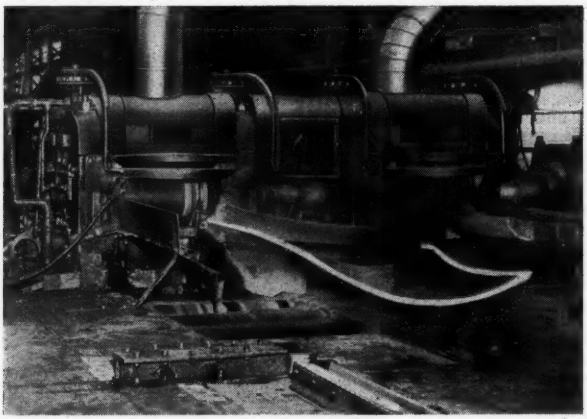
As required, the movable table (left) is driven to a point at which a pack of bars is between and in line with the furnace door and the ram of the pusher equipment. The furnace (above) has three burners at one end; the ejected bar falls on to a line of live rollers

first through a worm gear to a sprocket wheel which engages a chain, each end of which is anchored to either side of the movable table. At the far end of the base the chain engages with a "free" sprocket wheel. The overall reduction is from the motor speed of 1,000 RPM to a table speed of 44 ft. per min. The motor is, of course, reversible and all the operations are effected by means of push-buttons.

The pusher equipment is driven by a push-

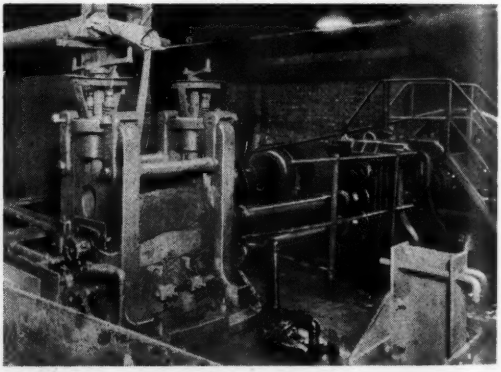
table is "held" during a sequence of pushing operations by the ram until the whole pack of rods is passed into the furnace. The table is then driven forward again, so that the next

button controlled, 15-HP, 970-RPM motor, immediately on the shaft of which is a solenoid brake which is brought into operation by a time relay at the end of each step forward of the ram, there being twelve forward steps, one for each bar, to complete a forward feeding run for a pack of bars. An extension of the shaft from the brake carries a worm from which transmission is, in turn, through a secondary shaft normally disposed to the motor shaft and gears to a rack on the ram. This is furnished with a limit switch at each end to prevent overrunning.



Rough rolls reduce the bar to 1⅛ in. square and the intermediate rolls to ¾ in. square ; note stop gate

The furnace is fired with crude oil which is gravity fed to the burners from a tank equipped with electric immersion heaters for preheating purposes. There are four burners, three at the front or delivery end of the furnace and one at the vertical face of a "step" in the furnace roof. The roof burner, directed towards the feeding end of the furnace, serves the preheating furnace zone. Air for "atomising" the oil and blowing this into the furnace is provided by two directly coupled 2,800-RPM motor-driven blowers on the furnace roof, a 22-HP set serving the three front burners and a 9-HP unit serving the roof burner. Three thermo-couples at each side of the furnace communicate with pyrometers for temperature recording purposes only.

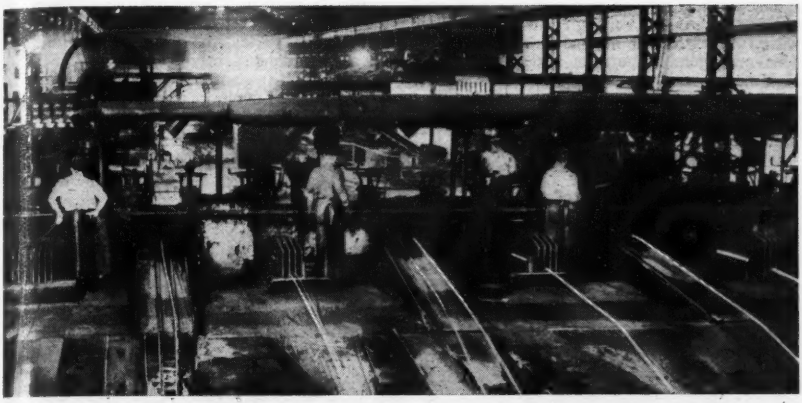


Auxiliary rolls are individually driven by a 400-HP motor with belt transmission to a flywheel and one-to-one gearing

From the foregoing it will be appreciated that as each bar is fed into the furnace the heated bar at the delivery end is ejected from the furnace. It falls down a ramp on to a train of live rolls at the floor level which carry it lengthwise forward to a hand-lever controlled stop gate in front of the first pass of the rough rolls in which the first series of reducing operations is effected. The bar is placed with wider face uppermost and when the rolls are ready to receive it the gate is released and the bar moves forward again. The rough rolls reduce the bar to 1⅛ in. square in four passes.

From the fourth pass of the rough rolls the rod travels round a repeater guide channel to the first pass of the three-high intermediate rolls from which it is tong handled to the second pass whence it travels along a channel fitted with rollers to the auxiliary rolls where it is man-handled for entry. The intermediate rolls reduce the rod to ¾ in. square, and the single-pass auxiliary rolls reduce it to 1⅛ in. by ¼ in. oval.

The rough rolls and the intermediate rolls are lined up as one train which is part of a group drive including the finishing rolls, to be referred to later. The auxiliary rolls, however, are individually driven by a 400-HP, 500/600-

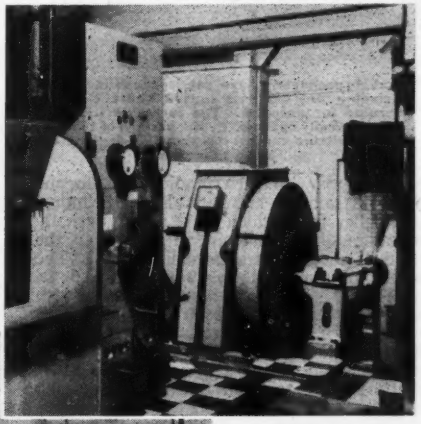


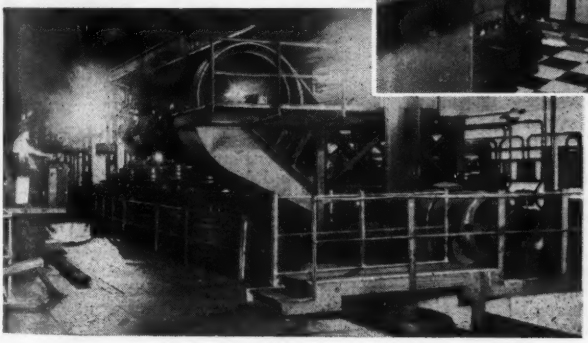
In the finishing rolls the rod is alternately converted from oval to square and square to oval

RPM AC motor which transmits by belt to a flywheel on a shaft with a one-to-one gearing with two shaft outlets directly connected to the top and bottom roll lines of the train.

From the auxiliary rolls the rod passes through a pipe and up a long channel to the finishing rolls where, after flaking out on the steel floor, its end is seized by tongs and fed into the first pass, after end cropping on a guillotine. There are nine passes in the train of finishing rolls and the rod is progressively reduced and alternately converted from oval to square and from square to oval section until it arrives at the last pass, which reduces it to round rod again—usually ¼ in. section. The alternate oval and square rolling prevents the formation of fins, with consequent oxidisation and wastage.

The driving unit for the two trains of rolls—the finishing train in one section and the rough and intermediate rolls in the other—is a 1,500-HP, 500-RPM, 415-V three-phase slip ring induction motor by the English Electric Co., Ltd., arranged in line with the finishing train for "straight" transmission.





Above: The 1,500-HP group driving motor for the finishing train and the rough and intermediate rolls is separately housed

The coilers (left) have a common variable-speed drive for coiling proper and individual drives for opening and closing the containing arms

It is separately housed in a nearby room, and transmission is first through a flange coupling with rubber-sleeved inward projecting pegs. This arrangement permits a degree of self-alignment, while the rubber sleeves afford relief from shock at starting.

The shaft is directly connected to a one-to-one gear box with three spindle outlets for the finishing train, but between this and the motor is a pulley from which there is an unusually interesting belt transmission scheme to the train of rough and intermediate rolls. The belt is of pure leather, 80 yd. long, 3 ft. wide and $\frac{3}{8}$ in. thick and it communicates with a 30-ton flywheel-pulley on the shaft of the rough and intermediate-rolls train. From the flywheel shaft there is "straight" transmission by one-to-one gearing with two outlet shafts for the top and bottom rolls of the train. The motor has normal starting arrangements, with a stator oil circuit-breaker and a liquid variable-rotor resistance unit. After running up to speed it is left running continuously during working periods.

From the last pass of the finishing rolls the rod is taken to and dealt with by one of a train of four coiling machines. After initial hand feeding the coiler itself pulls the rod round between its inner and outer drum units. The coil rests on six arms extending from the centre of the inner drum, and when the operation is completed these arms are withdrawn into the centre of the drum on the umbrella-operation principle, thus allowing the coil to fall on to an inclined conveyor underneath. The arms of each coiler unit are operated independently by a 4-HP, 750-RPM motor which transmits through a worm gear to a cam by which lever mechanism is put into operation to withdraw or extend the arms.

A chain conveyor (above) carries the coils through a cooling tank and to a station where they are handled for despatch. The turntable (right) is automatically operated by the passage of the coil; pedal switches control the arresting-peg and the "bucket" motors

The coiling operations proper, however, for all four coilers are effected by a variable-speed group drive—variable speed because of the increase of the rod speed as the diameter of the coil and roll increases. A 135/82-HP, 640/390 RPM motor is responsible for this work and it transmits by belt up to a shaft common to the line of four coilers. Simple vertical downward transmissions from this shaft to the coiler spindles are provided by bevel gears. The main motor and those for

operating the containing arms of the coiler units are all controlled from a central station by push-button contactors, with resistance variations for speed control. The motor driving the inclined conveyor under the coilers is also controlled from this station. It is a 30-HP, 720-RPM unit which transmits through a worm and gear train on to a spur wheel which engages with a sprocket on an extension of the shaft of the end drum of the conveyor, the reduction ratio being such as to give the conveyor a speed of about 4 ft. per min.

The coils pass on to a ramp of gravity rolls at the lower end of which they are arrested by upward projecting pegs which are opened out to let the coils pass as required by a small motor with pedal-switch control. As each coil is next passed on to a turntable it bears against a barrier fitted with an automatically operated switch by which the motor-driven turntable is put into operation. A limit switch stops the turntable at the required point and the passage of the next coil on to the other side of the turntable brings this back again to its original position in reverse.

The turntable discharges the coils into a pair of inclined tray-like containers or " buckets " which are turned over as required by a small pedal-switch operated motor, thereby passing the coils on to a pair of the hooks of an endless chain suspension conveyor. The hooks are arranged in pairs to suit the bucket spacings and limit switches on the hooks stop the conveyor at the right positions. The chain conveyor carries the coils through a cooling tank and along to a station where they are handled for despatch. A 3·5-HP, 1,500-RPM motor drives the conveyor by means of bevel-gear transmission on to a sprocket wheel which engages with the chain.

NEW BOOKS

The Rise of the Electrical Industry. By Malcolm MacLaren. Pp. 224; figs. 154. Humphrey Milford, Oxford University Press, Amen House, Warwick Square, London, E.C.4. Price 25s.

This history of technological progress during the nineteenth century, set against a scientific background, has been compiled by one who has held leading positions in the electrical industry in addition to having been for twenty-five years chairman of the Department of Electrical Engineering at Princetown University. At that University, Henry had carried out most of his investigations into electro-magnetism and his work naturally receives prominence. Although full credit is given to pioneers in the United States, their collaborators in other countries receive due recognition. The rapid developments since the close of the last century are outside the scope of this book, but fundamentals on which these are based were by that time in practical form.

After a preliminary chapter, which summarises events up to the time of Faraday and Henry, come chapters on communications, illumination, motors, generators, measuring instruments, early AC systems and the influence of the steam turbine. In one respect early hopes have not been fulfilled. At the Automobile Club Show in 1900, electric vehicles are said to have far outnumbered other types !

A twenty-page bibliography containing more than 350 references to technical books, journals, patents and papers read before engineering societies is a useful feature.—C.O.B.

Aircraft Electrical Engineering. By F. S. Spreadbury. Pp. 272; figs. 209. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, Kingsway, W.C.2. Price 21s.

The remarkable developments in aircraft construction that have occurred during the past twenty-five years have been accompanied by comparable progress in the electrical equipment, so that the largest planes often have a generating capacity of from 5 to 10 kW, while 25 kW may be reasonably anticipated in the near future. One object of the present book is to provide an adequate basis for design and this involves a knowledge of mathematics up to intermediate standard. The aspects mainly dealt with are ignition (including design and testing), generators and motors, AC and its rectification and applications, voltage regulation, radio, ripple smoothing and measurement, permanent magnets and pyrometry.—C.O.B.

Classified Radio Receiver Diagrams. By E. M. Squire. Pp. 164 ; figs. 332. Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d.

Oil-Engine Costs

A REPORT, mainly statistical, on heavy-oil engine working costs which has been presented at a meeting of the Diesel Engine Users' Association in London shows that not only have more returns been received from home stations in respect of the year 1941-42 than in the previous year, but that the amount of information contributed has also been so complete as to make it possible greatly to extend the tabulated technical details of engine performance.

The number of stations overseas sending returns has, not unexpectedly, declined although the total number of returns remains practically the same as in the previous report. Other tables and graphs have been brought up to date, with the exception of those relating to renewal and replacement costs and to liner wear which, in view of the abnormal conditions now prevailing, have not been altered.

The number of stations recorded is 56; although fluctuation of prices disturbs statistics relating to average costs, technical performance figures are not thereby affected. The possibility of compiling additional sections of the report to deal with engines for marine, railway and road uses has been revived, but inquiries in appropriate quarters revealed little prospect of the required information being made available.

Bonus on Quality

The Personal Factor in "Q.C."

By A. S. Wharton, F.S.S., A.I.I.A.

IN a recent article on statistical control of quality* it was shown that the operation of a machine could be controlled by means of a graph which gave, by trends in the curve, ample warning to the inspector and foreman when adjustments were required. Many operations, however, depend not upon the variation of a machine but upon the craftsmanship of the operative. This introduces a rather different aspect of quality control.

The simple Poisson-type graph, part of which is shown in fig. 1, was set out to control at a given percentage a run of samples made by two girls engaged on the same operation—the grinding of resistances. Here the major cause of error can be ascribed to bad workmanship on the part of operative No. 196.

By the schemes outlined a better quality of production can be encouraged, not only for war but also in the competitive markets of peace, when accuracy of operatives no less than that of machines will require to be greater than ever before

On this graph, control limits based on 1 in 40 and 1 in 1,000 chances were ruled in, termed "warning" and "action" lines. The ready comparison thus made available of the approximate quality of the girls' workmanship at any moment shows Clock No. 201 to be much the more competent operative.

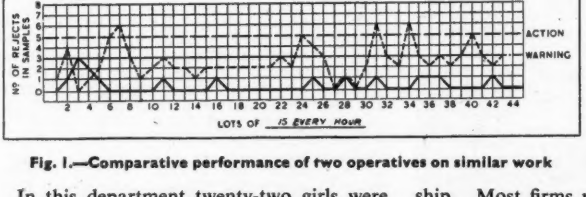


Fig. 1.—Comparative performance of two operatives on similar work

In this department twenty-two girls were engaged upon the same job and for some time their work was compared in competition style on eleven graphs. Partly due to the existence of a production bonus on speed alone and perhaps also slightly due to indifference on the part of some operatives, the quality of work of a proportion of the girls never improved, so it was decided to introduce some incentive based on quality itself.

Samples of fifteen were taken every hour and, as these were simply at random from the immediate run of production at that time, it was impossible for the girl to fake her inspection sample. Although one girl at any given moment may appear better than another, without this being really so, nevertheless, on a long run of results a good worker can always be demonstrated on a chart of this type.

Monetary incentive in this case was based as follows:—For every plotted result representing a number of rejects in a sample that was lower than the 1 in 40 or warning line, a bonus of 2d. was paid, but for every result touching the lower control line 1d. was deducted, whilst 2d. was taken off for every result over the warning limit. Thus, every time a girl produced a sample result as bad as a 1 in 40 chance she lost 3d.; *i.e.*, the 2d. she could have earned and 1d. deduction. On the other hand, no matter how comparatively bad the workmanship of a girl was, her ordinary fixed wage and production bonus were never affected. Thus, through the quality incentive a good girl stood the chance of gaining fifty twopences in a week whilst a poorer operative at the worst neither gained nor lost. This allowed for the learner or any girl who might be suffering from wartime fatigue or ill-health, and yet always provided an encouragement to the operative with a high standard of workmanship. Most firms pay for quantity but few offer appreciation in the form of £ s. d. for quality.

This simple method of interesting a girl in her daily run of results is carried a step further in connection with a newly commenced department, where we were not sure, to start with, what percentage of error might be expected as inherent in the process, having agreed that on the majority of jobs a certain number of rejects must always be allowed for. In this case the operatives were statistically tested hourly for a run of ten weeks. The percentage of rejects made by each girl weekly was calculated by

* Statistical Methods. By A. S. Wharton. *Electrical Review*, June 4th.

statistical means and plotted on a master graph. The results for all the girls were shown on this chart and a mean average percentage derived by adding the weekly results for all the operatives together and dividing by the number of operatives and the number of weeks. At the same time a standard deviation was calculated and a figure equivalent to plus and minus twice standard deviation ruled in. From this it was possible to decide the percentage of rejects which might be accepted as a fair average throughout the department. At the same time the highest result we might expect to find 1 in 40 times on the average, and the lowest limit to be found 1 in 40 times, could also be derived.

In fig. 2 this method is applied to four girls engaged on a hand operation where bar x fell at 7·7 per cent. rejects and the upper 2 sigma* limit at 14·2 per cent. with the lower limit at 1·2 per cent. It can be seen straightaway that two of the girls show a consistent run of good results, only three times exceeding the combined average, whilst operator No. 510 has a generally high trend, only twice falling below our x line. Using this master chart it would be agreed that no girl should be entitled to a quality bonus unless her percentage of rejects for the week was beneath 7·7 per cent. our bar-x limit.

At the same time, if any girl showed a result exceeding our bar-x plus 2 sigma, the case would need special investigation as undoubtedly, due to ill-health, bad training or general inability, she was proving incapable of handling her job.

Then the bonus would be staggered, increasing as the error diminished. Girls between 6 and 7·7 per cent. would receive, say a 2s. bonus with 1s. increase between 5 and 6 per cent. and an additional 1s. for each 1 per cent. below 5, so that if a girl was able to produce a standard of quality yielding less than 1 per cent. rejects she would receive 8s. bonus; this would approximate to our 1 in 40 chance.

This method of statistical calculation weekly of the percentage of error in any girls' work is sometimes very useful in a department of twenty or more operatives for forming a weekly "ladder." The girls with the best standard of quality would come at the top, the others being graded downwards according to the percentage of rejects found from sampling. The top four each week would be eligible for a special bonus of, say, £1, 10s. 7s. 6d. and 5s. It should be stressed that such a bonus would be additional to the fixed wage and production bonus in order to provide a separate incentive for quality of production. The advantage of the statistical testing method is that each operator can see hourly how she is faring and competitive feeling is promoted.

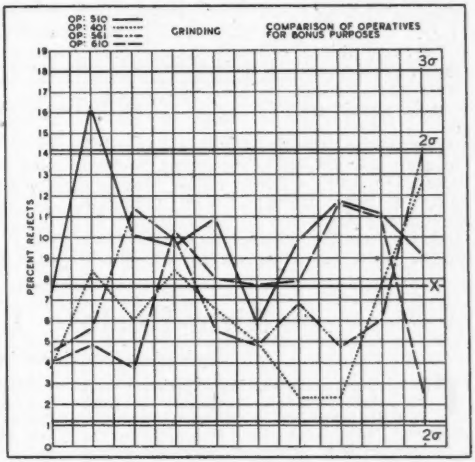


Fig. 2.—Method of ascertaining individual percentage errors

As an example of an article produced by hand involving close measurement, we can take the control of length of melt at cartridge sealing-in in the manufacture of a high-frequency lamp. The measurement here is required to fall between 60 and 65 mm. A sample of four is taken every half hour and the average results plotted on a graph. The average mean result has been calculated and a line ruled in falling at 62·7. Now, presuming that our results were produced stably and in accordance with the normal curve, we should require the sample average plottings to centre around 62·5 with a tolerance equivalent to the manufacturing tolerance divided by the square root of our sample size, *i.e.*, between 63·75 and 61·25. Controlling limits would, therefore, be ruled in at these measurements to show the aimed-at limits. With the progress of results a lower tendency is shown, proving that the

* The term sigma or σ is the symbol used to represent standard deviation, which measurement has been found to provide the most useful measure of scatter within a distribution. Standard deviation is the square root of the average of the squares of the deviations of all observations from the average observation. In a normal distribution a distance of 1·96 sigma each side of our mean would represent a measurement that would be expected to occur only once in 40 times above and once in 40 times below the mean in the distribution and this, for simplicity's sake, is roughly termed the 2 sigma control line. The 3 sigma line representing a 1 in a 1,000 chance is located, to be exact, at 3·09 times standard deviation from the mean.

operator is conscientiously trying to work within the rather close tolerance set for this type of work.

If a result exceeds the ruled-in limits, the probability is that individual results are falling outside our manufacturing tolerances and an average as high as these limits would be expected only once in 1,000 times, presuming a control on a normal curve with its extremities falling at 63·75 and 61·25.

To carry this a stage further, inner limits (based on the 1 in 40 chance on such a curve) can also be ruled in approximately at 63·3 and 61·7. On every average recording falling between these inner limits a bonus of 2d. would be paid, 1d. being deducted for all falling in the outer margin and a deduction of 3d. made for every result exceeding the 1 in 1,000 chance lines. By this means we should try to restrict the actions of the operative to the trend of a normal curve. Agreeing that it is almost impossible on work of this type to obtain perfect stability due to the fallibility of all jobs dependent purely upon human craftsmanship, nevertheless a fairly close control can be set. The actual statistical limits based on the results that were recorded for comparison purposes are shown in fig. 3, and the operation is very satisfactory as a result of careful control.

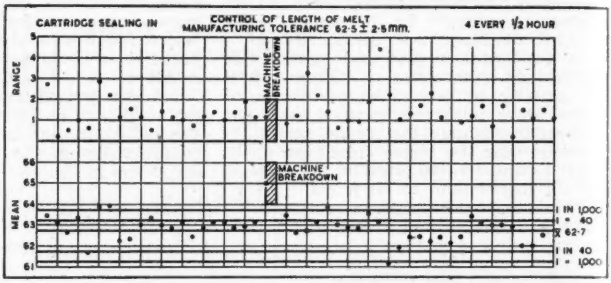


Fig. 3.—Control of quality within close limits

Auto-Reclose Breakers

Operating Experience in America

TWO reports on operating experience with auto-reclose oil circuit-breakers for rural supplies appeared in a recent issue of *Electrical Engineering* (the publication of the American I.E.E.). The first relates to single-phase 7,500-V distribution systems financed by the United States Rural Electrification Administration. On the 800 systems there are now 5,500 single-pole breakers of this kind, of which 2,455 (each controlling an average of 22·6 miles of line) are on 162 systems about which comprehensive data was available last year.

Results of a three-year survey indicate that the ratio of lock-outs to operations was less than 5 per cent. It is suggested that a specification should require the breakers to be self-contained without current or voltage transformers, but including lightning and overload protection, and to be equipped with two instantaneous openings and two subsequent time-delay openings to lock-out. Future developments are expected to call for an increased use of three-phase interconnected lines, for which directional control and discrimination between load and fault currents of the same magnitude would be needed.

The second report (of an A.I.E.E. Committee) concerns radial feeders of forty-one companies with more than 70,000 miles of circuits at voltages of from 2,300 to 44,000. Immediate initial reclosing is most often used for residential loads and 15 sec. delay for induction-motor loads. Initial reclosing has been successful for 75 per cent. of the trip-outs and second or third reclosing for 15 per cent.; lock-out has occurred in 10 per cent. of the cases. Many users require greater rupturing capacities than those provided for, better time-delay features to permit co-ordination with fuses and other fault-clearing devices and higher continuous current ratings.

In order to avoid the dropping of induction-motor loads it is held that circuits should be re-energised in from 0·5 to 2 sec. While no trouble from the restriking of the arc was reported with immediate reclosure of normal-speed breakers, some users prefer an interval of 0·5 sec. There are indications that immediate reclosure for motor circuits could be applied much more widely than at present.

I.E.E. Meetings and Non-Members

THE Council of the Institution of Electrical Engineers has decided that technical meetings of the Institution may be accessible to a non-member on completion of an application form and on payment of 7s. 6d. to cover administration costs. Such a non-member will then receive notices of technical meetings and a card of admission for the coming session, which will not, however, confer on him any status within the framework of the Institution or the right to join in the discussion without special permission from the chair. Those who wish to take advantage of the new facility, whether they reside in London or in the provinces, should apply to the Secretary of the Institution, Savoy Place, Victoria Embankment, W.C.2.

Electrical Fires

Avoiding Unnecessary Danger to Fire Brigade Officers

By S. F. Barclay,
D.Sc., M.Inst.C.E., A.M.I.E.E.
(Director, Mather & Platt, Ltd.)

OIL-FILLED transformers and switches have introduced a definite fire risk into generating and transforming plant. If automatic equipment is not provided to suppress the conflagration, the fireman's hose pipe must be requisitioned and the attendant risk of playing on to high-voltage conductors has naturally aroused interest. In the last ten years or so a number of authorities have made full-scale tests, notably the Central Electricity Board (*Electrical Review*, July 14th, 1933); the Paris Fire Brigade (Exposition Internationale de la Sécurité, June-July, 1934); Purdue University Experiment Station, Indiana, U.S.A. (*Engineering Bulletin*, Volume 20, No. 1, January 1936); and various American experimenters (*Electrical Review*, June 4th, 1943).

Referring to published data on water-jet conductivity tests the author states that the "tolerable current" values have varied widely with different experimenters and that there is nothing to justify any relaxation of precautions in dealing with fires involving h.v. gear

The published data of these different authorities are technically consistent, but there are wide variations in the test conditions selected and in the deductions drawn. Moreover, the objects of the tests have differed; the C.E.B. and Purdue University were not concerned with fires in electrical apparatus but with those in premises adjacent to high-voltage overhead conductors. Even on this specific issue the deductions differ widely. Whereas the C.E.B. affirms that the firemen can play with safety even on to a 132-kV line from a sufficient distance—about 80 ft.—Purdue University asserts that no hose pipe should be used against a higher voltage than 13,200. The current conducted by a jet playing on to an overhead wire can be much less than when the electrified target is of big area, as it may be in switchgear and transformer fires. There is thus no small danger of people without specialised electrical knowledge drawing general and dangerous conclusions from restricted tests. The published data need to be critically reviewed for the benefit of the fire services.

Varied "Toleration" of Current

The procedure adopted in the tests has been to ascertain or to presume the current a man can tolerate and then mount the nozzle in an insulated holder and measure the current flowing to earth under the various test conditions. The value adopted for this tolerable current has varied widely with different experimenters—from 3 to 50 mA—with the implication that it has some definite objective value. In reality, men vary widely in the current they can tolerate; the value differs even with a given individual from time to time and is not unconnected with his state of health.

In the early days of electric traction, objection was taken to 500 V on the grounds that it could be dangerous. The then Electrical Adviser to the Board of Trade discounted this opinion and gave an amazing demonstration on the City and South London Railway; in wetted boots he stood on the rails and sat on the live conductor at 500 V whilst slapping it with his hands. Later, he complained that people who ought to have known better spoiled the effect of his demonstration by suggesting that he was particularly insusceptible to electric shock (*I.E.E. Journal*, Vol. 31, 1902, page 762). Unhappily, this same voltage has since been responsible for many fatalities among people with a different physiological make-up. We are, however, here more concerned with incapacitating than with lethal shock; the efficiency and the moral of the firemen could be undermined by a much lower degree of electric shock than would be liable to cause a fatality.

Another point to be considered is that on the demonstration ground there is no difficulty in determining the exact distance of the nozzle from the electrified conductor, but such is hardly likely to be the case under fire conditions with smoke obscuring an unfamiliar target and in the darkness of the night. A disabling shock is too severe a penalty to impose merely for a man's miscalculation of a few feet.

Size of Jet

Various sizes of nozzles are used by the fire brigades; a man might quite safely be playing one of small bore on to an electrified target and then be joined by a colleague with one of larger size with unpleasant if not dangerous results. Even the direction of the wind is a factor; against the wind, the jet might be broken up into a safe, non-conducting spray and be restored to a more solid jet with the sudden reversal of wind direction, as can so readily happen in enclosed surroundings in gusty weather. The water pressure behind the jet plays its part in determining the flow of current and it can vary considerably in the course of a fire.

Another factor is the specific conductivity of the water; safe conditions could be changed to dangerous by the fire engine serving the hose pipes being switched over from a town's supply to an impure source—a probable happening in wartime. Waters from towns' mains differ widely in electrical conductivity and a technique which has proved to be safe in one district might be found dangerous in another.

Use of Earthing Wires

One of the testing authorities quoted recommends that an earthing wire should be run down the hose pipe from the nozzle to the connection at the other end; another of these authorities condemns the idea as dangerous, since the wire could be so easily interrupted in the rapid transportation and unrolling of the hose. The use of such a wire seems to presume that the hose pipe would always be connected to a well-earthed hydrant; it is just as likely to be connected to a pump unit carried on rubber tyres, drawing water from a non-earthed emergency supply, and so the proposed wire instead of protecting the man at the nozzle might carry danger back to those attending the pump. One authority recommends the use of rubber gloves for the fireman and insulated branch pipes whilst another condemns these as inadequate and advocates insulating boots.

Some of the published data imply that for any given nozzle and voltage the distance between the conductor and the nozzle is all that matters. Actually, the jet and the column of water in the hose pipe from an earthed supply constitute a potentiometer connection between the conductor and earth so that the voltage at the nozzle is a variable quantity dependent on the specific resistance of the water and the diameter and length of the hose connection.

Although fires involving the type of oil used for transformers and switches cannot be extinguished by the firemen's jets, nevertheless considerable benefit can result from the cooling action of the water in saving adjoining gear and buildings from heat damage, with curtailment of the spread of the conflagration.

A Condenser Effect

A spray discharge is thus more effective than a solid jet with the added advantage of a much reduced chance of electric shock. It should, however, be pointed out that although the discharge may be broken up into detached drops by a properly designed spray branch pipe, there can still be danger at close range from current flow due to the condenser effect of the closely spaced drops. There is, of course, no danger of this happening in permanent installations, in which projectors deliver a type of water discharge which is non-conducting over the shortest distances employed between the nozzles and the electrified conductors and in which, as a further safeguard, the pipe system is effectively earthed.

Fire brigade executives will thus see that despite the academic value of the tests under discussion they reveal nothing to justify any relaxation of precautions in dealing with fires involving high-voltage gear. That our firemen never shirk a legitimate risk is all the more reason why avoidable ones should be eliminated. A recommended procedure might be drafted as follows:—

(1) When attending fires involving electrical apparatus always endeavour to have the current cut off before tackling the fire.

(2) Always use spray branch pipes against fires of electrical apparatus. The dual-purpose type should be avoided in view of the possibility of the solid jet being used when the spray is intended. Instruct the men to stand as far back from the conflagration as the carry of the jet will permit; this is an added safeguard and introduces no loss of effectiveness whether oil fires are in question or not.

(3) When tackling burning premises in the vicinity of overhead power lines, always endeavour to avoid directing the water on to the electrified conductors. If, however, there is a chance of this occurring, then instruct the firemen to use their nozzles at the extreme length of carry.

(4) Rubber boots and rubber gloves should be issued to the firemen when there is any question of electrical apparatus being involved.

Fatalities

Girl's Death while Blackberrying.—It is reported in the *Somerset County Times* that a loose wire which had broken away from a nearby pole and lay concealed in a blackberry bush caused the death of a thirteen-year-old girl.

At the inquest which was held at Bristol last Friday, a verdict of "Accidental death" was returned. An official of the North Somerset Electric Supply Co., Ltd., said that the break was due to abrasion on a nearby tree. Six of the strands had been rubbed through and the seventh fractured under the strain. He said that the line was alive because it had been to a certain extent suspended by the blackberry bush.

Labourer Killed.—A verdict of "Death by misadventure" was recorded by the South-West Lancashire coroner at an inquest on John Concannon, aged forty-one, a labourer employed at a factory. It was stated that he received a fatal shock when he touched an electric light wire hanging down outside a doorway. Wilfred Hoggard, foreman electrician, said that the wire had been at least 10 ft. from the ground and could not have been reached without a ladder, but he found that it had been moved from its suspended position to within 4 ft. of the ground and the tail piece had been cut off. No one had any right to interfere with the wire.

Coal Conservation

Framework of a National Fuel Policy

SPEAKING at a luncheon given by the Institute of Fuel on October 15th, Major Gwilym Lloyd George (Minister of Fuel and Power) referred to the increasing mechanisation of the coal industry during the war which, he considered, should be extended in future. Coal, he pointed out, was not a finished product, but a raw material—or rather several raw materials. The industrial future of the country depended on its coal resources, and not only was knowledge of them essential but also improvement in the methods of use. One good from the war was the stimulus it had given to invention and technical ingenuity. Much was due to co-operation of consumers and producers of coal and plant manufacturers, which must not be lost after the war; the best guarantee of its continuance was to lay the foundation now.

The retiring President, Mr. W. M. Selvey, installed his successor, Dr. E. W. Smith, who presented the Student's Medal to Mr. F. A. B. Maggs (British Coal Utilisation Research Association) for his paper on "The Relation between Heat and Wetting and Absolute Value of Surface Coals." He also presented the Melchett Medal for 1943 to Dr. E. S. Grumell (who is chairman of the Fuel Efficiency Committee). Reports of Dr. Smith's presidential address and of the Melchett Lecture appear below.

Dr. Grumell and Dr. Smith were thanked in brief speeches by Lord Melchett and Mr. W. M. Selvey, and tribute to the practical significance of the lecture was paid by Mr. Tom Smith (Parliamentary Secretary, Ministry of Fuel and Power) who promised support to Dr. Grumell's plea for the endowment of fuel research.

Presidential Address

THERE have been frequent demands for a national fuel policy, but no one has defined clearly what is meant by that phrase. In his address, Dr. E. W. Smith expresses the view that such a policy must be based on a comprehensive survey of the importance of fuel to the nation, the availability of coal of all kinds, the uses to which coal is being put and the efficiency with which it is being utilised.

He has no doubt whatever, in view of the known limited quantity of readily available coal and the conditions under which it has to be won, that the policy to be adopted should aim at conserving resources to the limit of national capacity, consistent with the provision of ample supplies of heat, light and power for the community. The fuel industry should concern itself with those needs rather than endeavour to increase the consumption of coal. First preference should be given to the study of improved methods of using both fuel and power, of all kinds, with the overriding object of conserving coal. Research should be co-ordinated and increased, but the lessons learned from completed researches ought to be more fully applied.

Heat, light, power, and the raw materials from which they are derived, should be handled as public utilities; in particular coal must be treated as a national capital asset. The problems of each industry (coal, gas, coke, electricity) should be solved individually so far as may be possible prior to any attempt at closer integration. It will never be healthy to allow one industry to succeed at the unjustifiable expense, from the national point of view, of any of the others. The suggested division of the country into areas in some of which gas only would be available to consumers for heating and in others solely electricity, is not taken seriously by Dr. Smith, who believes that all four commodities must be available to all within reasonable limits.

Selling Prices

It appears to him, too, that it may be advisable for Parliament to appoint a Tariff Commission with broad terms of reference in respect of the selling prices of coal, gas, coke and electricity, so as to ensure equitable treatment on similar lines (though not the same) to each of the fuel industries.

Dr. Smith firmly believes that the time has come for a very thorough overhaul (not dependent on the unplanned bargaining of one undertaking with another) of the gas industry in order that it may be rationalised and regionalised.

The function of the Institute of Fuel is to act as a catalyst for assisting the development of all other fuel interests (when required) by co-ordination. Systematic education is needed in the right use of fuel suitably graded for every class of the community. The Institute accordingly proposes to attempt the co-ordination of all the varied educational requirements and proficiency qualifications of professional institutions by suggesting that all those who have in any way taken part in setting up standards of education in any branch of fuel should collaborate with the object of eliminating duplication. If the main lines of policy can be agreed upon the Ministry of Education might favourably consider proposals having for their object the inculcation into the minds of children

taking the School Leaving Certificate sufficient elementary science and practical experience to enable them to appreciate the first principles of heating and ventilation met with in everyday life.

The Melchett Lecture

CONSERVATION of resources is the subject of this year's Melchett Lecture to the Institute of Fuel by Dr. E. S. Grumell (I.C.I., Ltd.), who quotes statements that many millions of tons of coal are left abandoned in collieries because it has become economically impracticable to continue working it. The result is that whereas in Germany the average life of the collieries at the total of the current rates of output is 185 years, that of British collieries is 75 years. If the total of the annual outputs is divided into the estimated coal reserves only in seams being worked, the average life of all the collieries will not be more than 45 years.

So far as is known these statements have not been challenged. Consequently the lecturer is of the opinion that in order to obtain maximum efficiency of production and utilisation, thus setting free coal for export and making it possible to develop new industries producing oil and chemicals from coal, consideration of fuel problems should, in principle, start at the colliery itself. Instead of consumers insisting on the preparation of special fuels to suit their individual appliances, the coal industry should state after examination how coal can be most cheaply and efficiently mined and prepared. It will then be the duty of fuel technologists to design plant to utilise efficiently what the coal industry can produce most economically.

Sampling and Grading

Dr. Grumell considers, in turn, the correct sampling of coal and coke as the basis of a large number of operations; industrial classification and grading of fuels; their evaluation and preparation, combustion and, finally, research; all with the object of emphasising that conservation of resources should be the keynote of the future.

Comprehensive planning of research cannot be initiated until it is known how much of each type of coal exists and can be expected to be brought to the surface economically. The Ministry of Fuel and Power has commenced, at least approximately, to estimate resources and distribution of the various types; also to ascertain in detail the total requirements of industrial and domestic consumers of all forms of energy.

Considerable importance is attached to the setting up and stabilising of a rational price structure which will fairly differentiate between the relative values of different qualities, sizes and types of coal; steps to establish relative values are already being taken. The preparation of low-ash coal is discussed in some detail, it being suggested that full use is not being made of the easily cleanable properties of British coals, particularly by the carbonising and iron and steel industries. A committee has been set up to study sizes of coal; the use of fines is discussed in detail, the suggestion being that (given a rational price structure) separate use might be the best policy.

The rapidly increasing cost of coal is viewed with concern, especially the relative rate of increase between this and other countries. Preliminary experimental gasification underground might be carried out at relatively small cost in an outcrop field.

All research at present in hand should be classified in order of priority, to give preference to investigations expected to reduce the present inefficiency of utilisation. Change in procedure is needed to place the staffs of research associations into closer contact with practical operation and also to reduce the time lag between research conclusions and their application.

Safety in Mines

IN the twenty-first annual report, for 1942, of the Safety in Mines Research Board, it is stated that research has for many years sought, first, to perfect flame-proof enclosures in order to prevent ignition of gas (caused by internal sparking) from transmitting flame to the general atmosphere, and, secondly, to produce intrinsically safe circuits, *i.e.* circuits incapable of giving rise to a spark strong enough to ignite firedamp. The latter safeguard is applicable only to low-power circuits such as those for signalling and shot-firing. Flame-proof enclosure is now highly efficient, although based on only a limited knowledge of the principles involved. Intrinsic safety is based much more on empirical knowledge, which cannot yet be reliably applied to all the complex low-power circuits underground, such as for the remote-control of power plant.

Schlieren photographs of gas ejected from between the flanges of an 8-in. cubical vessel during an internal firedamp explosion showed that a short stab of flame appeared about 0·007 sec. after ignition and was followed by a thin jet of hot products of combustion lasting several tenths of a second. The sensitive thermocouple previously used had recorded only the latter, which probably does not ignite an external mixture, that being done by the earlier flame.

Laboratory experiments have been made with the object of defining conditions in which the rapid combustion of a solid explosive will produce the abnormal pressure required at about the same rate as that of an explosion of firedamp. In suitable conditions guncotton yarn provided what was required. The results are to be applied in large commercial enclosures.

Two experimental 12-shot exploders of the same type as the 6-shot exploder, complete with circuit-testing indicator, have been in regular use during the year, and commercial production is contemplated.

Boiler Efficiency

Preventing and Removing Deposits

EFFORTS to save fuel during the present war and how they may affect the post-war utilisation of coal by public utility undertakings and in factories form the subject of the inaugural address of Mr. C. T. S. Arnett (C.E.B. district manager, North-West England and North Wales) as chairman of the North-Western Centre (Manchester) of the Institution of Electrical Engineers.

Mr. Arnett does not claim to introduce original considerations into his review of the activities of central and satellite regional committees and the various trade association panels which concern themselves with the allocation of coal and the giving of directions, after inspection, for its more efficient utilisation in industrial boiler plant and for process heating purposes. All of them have effected economies in consumption and better understanding has resulted between suppliers and users of fuel, so helping to minimise uneven and inadequate supply of suitable grades to different industries. Mr. Arnett considers that it will be necessary for the Public Utilities Coal Committee (advisory) of the Ministry of Fuel and Power to continue to operate at least during the early post-war years.

Research and Advice

The Boiler Availability Committee has divided its activities between short-term measures for the quick removal of harmful deposits and the fundamental causes of bonded deposits on the heating surfaces, which result in reduced boiler availability. In addition intensive research is proceeding in respect of the combustion process in both stoker fired and pulverised fuel boilers. Information about the removal of harmful deposits by means of water lancing and steam soaking the heating surfaces has been circulated to the electrical industry and practical demonstrations have been staged at several power stations. If such cleansing increases the steaming time appreciably, thereby raising the average efficiency of combustion, then a saving of fuel will result.

Modification of the way in which air is admitted under chain grates will not only be beneficial in suppressing harmful deposits, but may also increase the range of fuel which can be fed to the grate when carefully graded and properly blended.

Air heater fouling is also being investigated; it has become more prevalent of recent years and engineers have tended to eliminate, or reduce, air heater surface in order to counteract fouling trouble. Mr. Arnett does not support that tendency; he believes air heaters to be worth while when maintained in a clean condition and that their elimination will necessitate lowering the temperature from the feed heating train associated with the prime mover, which will reduce the overall efficiency and hence increase the consumption of coal.

The district Consultative Technical Committees of the Central Electricity Board have perhaps made one of the greatest contributions to the reduction of fuel consumption in this country, for in 1942 there was a saving of not less than 28 million tons of coal in electricity generating stations as compared with performance twenty years previously.

In the past, coal production efforts have been warped by collieries striving to work large coal for household use and export, because of the higher ruling prices for those grades. If in future a greater proportion of the whole were to be screened and de-dusted prior to going to the washeries and, in addition, a rational percentage of external mineral ash were to be removed by recognised processes, large boiler plants could receive fuels containing only such quantities of coal of $\frac{1}{8}$ to 0 in. size as would suit their particular plants. Those responsible for supplying fuel must realise that fine coal for power station grates must be carefully blended and mixed to avoid fires of unequal rates of combustion.

Forthcoming Events

Institution of Electrical Engineers.—Monday, October 25th, 5.30 p.m. Informal discussion on "How Far is International Standardisation in the National Interest?" to be opened by the President.

North-Eastern Centre.—Monday, October 25th, 6.15 p.m. Neville Hall, Westgate Road, Newcastle-on-Tyne. "The High-pressure Gas-filled Cable," by Messrs. C. J. Beaver and E. L. Davey, B.Sc.

South Midland Centre.—Monday, October 25th, 6 p.m. James Watt Institute, Birmingham. Opening meeting of Wireless Group, with address by Mr. T. E. Goldup. *Students' Section.*—Wednesday, October 27th, 6.30 p.m. "High-frequency Transmission," by A. H. Ray.

Association of Mining Electrical and Mechanical Engineers.—*South Wales Branch.*—Saturday, October 23rd. 5.30 p.m. Mining Institute, Pengam. "Mono Pumps in Mining Service," by Mr. F. W. McCombie.

Yorkshire North-West Branch.—Saturday, October 23rd, 3 p.m. Hotel Metropole, Leeds. Address by Mr. S. Preston, Branch president.

British Institution of Radio Engineers.—Thursday, October 28th, 6.30 p.m. Institution of Structural Engineers, 11, Upper Belgrave Street, London, S.W.1. "Colour and Stereoscopic Television," by Mr. J. L. Baird.

Radio Silver Jubilee

A Quarter of a Century's Progress

DURING the last eleven years the membership of the Wireless Section of the Institution of Electrical Engineers has doubled. It has now entered upon the twenty-fifth anniversary year of its formation, so that it is perhaps appropriate that the inaugural address of Mr. T. E. Goldup (Mullard Radio Valve Co., Ltd.) as chairman for the silver jubilee session should be an historical review of progress achieved.

In briefly surveying the manufacture of thermionic valves since the inception of broadcasting, Mr. Goldup points out that the earlier phase, in which increasing output of power, and therefore of size, was the chief requirement has now been reversed as the result of growing utilisation of higher frequencies, which has caused a good deal of valve design work to be undertaken.

In commenting on advances made in broadcast transmission and reception of both sound and vision, Mr. Goldup states that wire distribution of the modulated carrier frequency has the advantage of enabling several channels to be accommodated in one cable, but highly skilled work is necessary to connect listeners to such a system and complete coverage of outlying districts is impracticable. The programme coverage of the whole country by the present methods in the medium wave band, while economic, has such disadvantages as liability to interference and fading, but they are capable of minimisation to a great extent in practice; in fact, it seems that none of the wire systems can compete with medium wave carrier broadcasting, either economically or in respect of coverage.

Superior quality of reproduction, low noise level and freedom from interference can be obtained with wired systems, but at increased cost. Requirements can best be satisfied by medium carrier wave broadcasting for national coverage and by ultra-short-wave regional distribution, possibly employing frequency modulation, for densely populated centres.

Future of Television

Factors favouring retention of the pre-war system of television for immediate post-war use are that the 45 Mc/s carrier frequency employed causes the minimum of trouble from echo reflection, permits the continued employment of existing types of valves for amplification, a general design of appropriate receivers is well-established and production experience is available. Study of the mechanical design of receivers and production methods can undoubtedly reduce production cost considerably, and cost need not be added to by technical improvements. Expansion of the television services to the provinces is probably quite feasible with the present frequency, apart from the fact that there were some 50,000 potential viewers for the service as it existed immediately before the war.

Contemplation of a higher definition system will delay re-commencement of the service. The magnitude of the controversial technicalities involved in improvement of picture definition suggests that immediately after the war it may be best to retain the old system side by side with a new system in an experimental stage to permit gradual solution of technical problems in an economic way.

Reference is made to the more recent achievements in commercial radio communication services, while industrial applications of thermionic devices are mentioned as a reminder of the rapidly growing importance of this expanding field of development.

Freedom in Development

In the latter portion of his address Mr. Goldup reviews the organisation of the broadcast section of the radio industry and the control exercised upon it by the various trade associations and the technical Press. The net result of complete freedom in respect of research, technical development and manufacturing technique has been fairly satisfactory, although one of the disadvantages of such unrestricted procedure is a tendency towards non-standardisation of products and methods, which has been emphasised by wartime expansion of productive capacity and partly remedied by intensive effort. For instance, it has been possible to specify a series of 30 laminations for use in new radio transformer designs where formerly some 600 different sizes were used in Service equipment.

The growth of the industry is revealed by Board of Trade returns, which indicate that the value of radio receivers and radiogramophones rose from £4,000,000 in 1924 to £12,000,000 in 1935, while the B.R.V.M.A. output for civilian purposes alone increased from three million valves in 1927 to eight millions in 1939 with a peak output approximating to ten millions in 1937.

The popularising influence of the technical Press has certainly been considerable, serving to guide both public and trade opinion and to act as a check to possible too hasty introduction of television. The contribution of substantial numbers of wireless amateurs to general advances in radio technique has been not inconsiderable. The pioneering and educational value of their hobby has been of immense value, especially in respect of the use of ultra-short-waves.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Central Electricity Board has appointed **Mr. E. J. Edgar,** A.M.I.E.E., district manager for the North East England Area, to be district manager for the Central Scotland and South Scotland Areas in succession to **Mr. A. E. MacColl,** M.I.E.E., who relinquishes the post at the end of October to take up his new duties as deputy chairman and chief executive officer of the North of Scotland Hydro-Electric Board. The Mid-East England and North East

Mr. E. J. Edgar

Mr. V. A. Pask

England Areas are to be combined for administrative purposes under **Mr. V. A. Pask,** M.I.E.E., M.I.Mech.E., the present district manager for Mid-East England.

Mr. Edgar, who has been the Board's district manager for North East England since the beginning of 1938, was previously for six years operation engineer for the South West England and South Wales Area. He received his technical education at the Manchester College of Technology and served his apprenticeship in Manchester with Messrs. Beyer & Peacock and with the Lancashire Dynamo & Motor Co. After service in the last war, he returned to a post with the Cleveland & Durham Electric Power Co. and subsequently held appointments with the Newcastle-on-Tyne Electric Supply Co. and the Belfast Corporation Electricity Department. Before joining the staff of the C.E.B., Mr. Edgar held the post of chief engineer with the Shanghai Power Co.

Mr. Pask joined the staff of the C.E.B. as district manager for Mid-East England at the beginning of 1940. Previously he was for eight years city electrical engineer of Norwich. A native of Manchester, Mr. Pask was educated at Preston and received his engineering training at the Preston Technical Schools and in the Tramway Department of the Preston Corporation. He subsequently served on the staffs of the Paisley, Hull and Bootle electricity undertakings and from 1920 until his appointment to Norwich, he was deputy general manager and engineer of the Newcastle & District Electric Lighting Co., Ltd.

Mr. A. V. M. D'Arcy, who has been in charge of instruments and meters in the research laboratory of the British Thomson-Houston Co., Ltd., since 1931 has retired. The *A.E.I. News* states that Mr. D'Arcy had been in the service of the B.T.H. Co. for nearly fifty years. He began as a tester in the Meter Department in 1895 at Westminster, and in 1902 was transferred to Rugby, in charge of standardising work and the experimental electrical laboratory. When the Meter Department was moved to Willesden in 1916 he went there as chief of the Department, returning to Rugby in 1931 to take up the position from which he has just retired. A presentation of a cheque was recently made to him by his old associates and the staff in the research laboratory.

Sir William Y. Darling, Lord Provost of Edinburgh, has been appointed a director of Bruce Peebles & Co., Ltd.

Grimsby Corporation Electricity Committee on October 5th confirmed its previous recommendation that **Mr. J. L. Bates,** distribution engineer, should be appointed chief assistant engineer, and that he should be succeeded by **Mr. W. C. Stapleton,** district engineer. The Town Council had referred the matter back to the Committee, members suggesting that the positions should be advertised.

Mr. R. W. Towers, who has been associated with the Rheostatic Co., Ltd., for many years as a member of the sales and technical staff, has been appointed to the position of contracts manager with the company.

Mr. E. H. McNulty has been appointed general manager of R. H. Symonds, Ltd. He has been in the company's service for twenty-five years.

Mr. M. Campbell, transport manager of the General Electric Co., Ltd., has retired after nearly 25 years' service. Mr. Campbell joined the company shortly after the last war to form a department for the control of transport for the whole organisation. At that time the company's delivery facilities in London comprised three horse vans; in 1939 it ran a fleet of forty motor vans operating to places up to forty miles from London and a daily delivery service within a radius of 20 miles. The department, in addition, covered the transport of G.E.C. products by road, rail, sea or air all over the world. Mr. Campbell was a foundation member of the Institute of Transport and is a Fellow of the Industrial Transport Association.

In addition to his business activities Mr. Campbell has always been closely associated with the sporting affairs of the G.E.C. An enthusiastic cricketer, he played for the G.E.C. first eleven for many years and for a considerable time undertook the duties of ground superintendent.

Obituary

Mr. H. Willoughby Ellis.—We learn with regret of the death on October 15th, following an operation, of Mr. Herbert Willoughby Ellis, M.I.E.E., controlling director of Ellis & Ward, Ltd., electrical, mechanical and hydraulic engineers and contractors. For many years Mr. Willoughby Ellis had played a prominent part in the affairs of the Electrical Contractors' Association. He was president of the Association in 1929-30.

He was associated with some early rural

electrification work in the Buckingham and Bicester districts and later on acted as engineer to the "Brush" agency in London. The firm of Ellis & Ward was founded in 1898 in Birmingham and a few years later the head office was transferred to London, and under the direction of Mr. Willoughby-Ellis it carried out much important work in the United Kingdom and abroad. Mr. Willoughby-Ellis was also interested in the manufacture of electrical plant and machinery on a large scale. In other fields of science he had been president of the Philosophical Society; fellow and vice-president of the Entomological Society of London; and he was a past-president of the Midland Microscopists' Union. He was also a fellow of the Zoological and Geological Societies.

Mr. A. Nichols Moore.—Engineers all over the country will learn with regret of the death of Mr. A. Nichols Moore, M.I.E.E., M.I.Mech.E., borough electrical engineer and transport manager at Newport, who had played a prominent part in the electricity supply industry for many years past. He was sixty-six years of age.

The late Mr. A. Nichols Moore

Mr. Nichols Moore received his training at the Sheffield School of Technology (now Sheffield University) and with Mr. W. J. Walker, consulting engineer at Westminster, and was a pupil with the Brush Electrical Engineering Co., Ltd., Loughborough. He commenced his electricity supply career with the Hull Electricity Department in 1899 as charge engineer and subsequently held similar appointments in the Sheffield Tramways Department and Manchester Electricity Department. In 1904 he was appointed assistant resident engineer at Stuart Street Power Station, Manchester, and in the following year became resident engineer to the Belfast electricity undertaking, being appointed deputy city electrical engineer in 1907. He left Belfast in 1912 to take up the position of borough electrical and transport engineer at Newport.

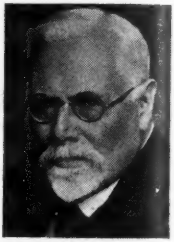
Mr. Nichols Moore was a past-chairman of the Western Centre of the I.E.E., a past-president of the I.M.E.A. and one of the Association's representatives on various allied associations, and a past-president of the A.M.E.E. He was also chairman of the C.E.B. Consultative Committee for the South-West England and South Wales Electricity Area, and in 1939-40 he was chairman of the E.D.A. Council.

Sir Albert Martin, the oldest member of the Southend Corporation, died on October 5th at the age of eighty-one. As chairman of the Transport Committee he drove the first tram in Southend in 1901, and he also supervised the installation of electric lighting in the town.

Mr. F. Wiekler.—The death occurred on October 13th, at the age of 52, of Mr. Frederick Wiekler, chief accountant of the Electricity Supply Board, Dublin. Mr. Wiekler was a native of Stuttgart. He went to Ireland in 1926 as an employee of Siemens-Schuckert, who were responsible for the Shannon Scheme and became chief accountant of the E.S.B. in 1938.

Mr. H. J. Butterfield, M.I.E.E.—We regret to record the death, which occurred on October 15th at the age of 60, of Mr. Henry James Butterfield, managing director of Hill, Upton & Co., Ltd., registered installation contractors and members of the E.C.A., of Oxford. He received his training with Lucy & Co., Oxford, and was also for a time with the Oxford Electric Co., Ltd., becoming principal of Hill, Upton & Co., in 1919. Mr. Butterfield was a member of the London & Home Counties Sectional Board of the E.C.A. and it was hoped that he might be chairman next year.

Mr. G. L. Addenbrooke.—By the death of Mr. George Leonard Addenbrooke, M.I.E.E., which occurred on October 12th in his eighty-fourth year, the electrical industry has lost yet another of its pioneers.



The late Mr. G. L. Addenbrooke

Mr. Addenbrooke came from a family of ironmasters; his father was on the first Council of the Iron & Steel Institute. Mr. Addenbrooke was educated at Winchester and after matriculation at London University, he was placed in the office of the London agents of the British India Steam Navigation Company. In 1883, however, he was persuaded by Sir Edwin Dawes to take up an engineering career, and shortly afterwards he joined the United Telephone Co. After experience in overhead wiring he became chief of the testing and trunk line department, where he had considerable experience in cable testing. In 1885, in conjunction with the late Dr. Ferranti, he took out a patent for a method of working double trunk lines in connection with single subscribers' lines.

He joined Dr. Ferranti in 1886 at the Grosvenor Gallery power station, but severed his connection in the following year and commenced on his own account as a consulting engineer. In 1888 Mr. Addenbrooke went to Australia for his old firm, Gray, Dawes & Co., where he fitted up a number of coasting steamers with electric lighting and visited the leading towns and goldfields to report on the prospects of using electricity in the Colonies. On his return he visited Spain for Crompton & Co., and after a few months with the House-to-House Co., resumed his consulting practice.

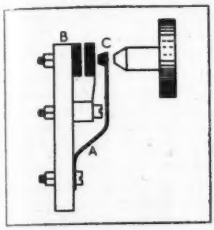
He was largely interested in the inception of the undertaking for the supply of electricity throughout the Black Country, which is now known as the Midland Electric Corporation for Power Distribution, Ltd., and he was engineer to the promoters. He was also connected in their early days with the S.W.S. Co. and the Kent Electric Power Co. He directed much attention to alternating currents and their measurement, and worked out a complete set of instruments and a system for this purpose. Mr. Addenbrooke was the author of many papers read before the I.E.E. and he contributed to the *Proceedings* of the Physical Society, of which he was a Fellow, and to the electrical Press.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Starting Single-Phase Motors

I WISH to thank Mr. S. H. Harding for pointing out, in your issue of October 1st, the mistake in the stop-button connections in my diagram published in your issue of September 24th.



Starter conversion

With reference to his remarks concerning the carrying capacity of the start button contacts, I did not feel it necessary in my original letter to stress the point that these would have to be designed in accordance with the duties they have to perform. I append a sketch of the conversion carried out in a few hours by a works maintenance electrician to a well-known make of starter. This has given absolutely trouble-free service on a ¾-HP motor.

High Wycombe. B. RAYNOR.

[By an error in preparing Mr. Harding's sketch for publication, the stop button was shown open instead of closed.—Editors, *Electrical Review*.]

From Lord Strathspey

Federation for Export

BRITISH manufacturers do not seem as yet to have made up their minds about how they propose, when the war ends, to go about selling to other countries what they make. It is true that the Board of Trade set up last year a Central Committee of Export Groups, although others have suggested that it would be well if the Groups themselves were to begin to fade out of existence when peace arrives. The Association of British Chambers of Commerce advocates a Council of Industry. The Institute of Export and the Federation of British Industries have probably got plans of their own.

Although there is so much diversity in the approach to the problem, the need for an expanding export trade is, naturally, accepted by all. There is an almost equal unanimity that each industry must be left in control of its own affairs; that the flexibility of private enterprise ("a good ship," to quote Sir William Beveridge, "which has brought us thus far") must be reconciled with the rigidities of the planner.

A step out of this confusion about the means to be taken to attain an end universally desired is indicated by the action of the rubber industry which has now grouped 24 distinct associations into one Federation of 289 firms with 320 factories. Their common bond is that all of them use the same raw material—for shoes, tyres, belting, gloves, sports goods, garments, and a variety of other goods.

The example of this important cross-section of British industry might usefully be considered by other trade associations who will have already been impressed by the advantages of working together in wartime. Let them federate. When they have done so they will hold the key to regulating the flow of trade into those channels which will yield maximum employment to the men as they come home.

Rottingdean, Sussex. STRATHSPEY.

Steel for Cookers

THE Electricity Commissioners have drawn the attention of electricity supply authorities to the present arrangements for the authorisation of iron and steel required for certain electric cookers. In the case of domestic cookers with a capacity of over 3 kW, authorisation will continue to be issued by the Commissioners direct to manufacturers. In so far as supply authorities themselves desire to purchase such cookers it is assumed that they will only be installed in the special circumstances already prescribed by the Commissioners and manufacturers are accordingly authorised to supply the cookers direct without obtaining prior authorisation for the iron and steel.

As regards cookers of these sizes required for installation in domestic premises by bodies or persons other than authorised electricity undertakers (*e.g.*, by electrical contractors or factors) the purchasers will be required to furnish the manufacturers with a written assurance from the local electricity supply authority that it is satisfied that the cookers will only be supplied or installed in the prescribed special circumstances. This is not necessary when specific approval has been given by the Commissioners, nor when the material is required in respect of spare parts for the repair or maintenance of existing cookers of a capacity of over 3 kW. If an undertaking feels that it cannot give an assurance the bodies or persons concerned may approach the Commissioners direct on the matter.

These arrangements do not apply to cookers of 3 kW or under (or spare parts) for domestic premises or to cookers of any capacity for industrial or other non-domestic premises. In the former case it will be necessary for manufacturers to apply for authorisations to the Industrial Supplies Department of the Board of Trade, and in the latter case to the Department concerned for the industry or purpose for which the cookers are required.

Sydney Council's System

Influence of War Conditions

REPORTS recently reviewed in these pages have indicated the effect of war conditions on electricity supply in South Africa and Canada. Now, representative of experiences in another part of the Empire, we have received the 1942 report of Mr. R. Vine-Hall, general manager of the Sydney County Council, New South Wales.

Mr. Vine-Hall, who was due to retire this year but whose period of service was extended for six months pending a decision about a successor, tells how 1942, the first year of the war with Japan, saw a general quickening of the tempo of war operations. This was reflected in the costly A.R.P. works undertaken by the Council, involving an expenditure of £206,114, the screening of street lamps, assistance given in the construction of munition works and supplying power to them, etc. Also, increased pressure of work fell upon the staff. Apart from 705 employees absent on military service, the Council's officers were called upon to fill many important positions as engineers and executives and to give technical advice. Mr. D. J. Nolan, assistant general manager, was given further leave of absence for service with the Commonwealth Government, and 131 employees were on loan to public and commercial bodies engaged in war work. In May last year the Council received permission to employ women as meter readers and meter testers, and 80 were subsequently appointed.

Mr. R. Vine-Hall, general manager, Sydney County Council

Industrial Heating

Restrictions placed upon the production of electrical apparatus for civilian use naturally resulted in a marked curtailment of the Council's selling activities, but against this there was a steady increase in the number of inquiries for electric industrial heating equipment, and during the year many large heat-treatment furnaces and other special industrial heating appliances, with a total rating of 10,031 kW, were connected. Furthermore, a number of all-electric canteen services were provided for employees in the defence services, and an increase in the demand for such facilities was experienced, especially towards the end of the year. There was, in addition, a further marked extension of the installation of electric cooking equipment in hospitals. All these factors contributed to the growth in total quantity of electricity sold from 760·4 million kWh to 1941 to 787·7 million kWh last year, despite a reduction of 9·3 million kWh in street lighting supplies. At the end of the year there were 274,627 consumers, 3,019 having been connected during the twelve months.

Practically the entire production of 922·6 million kWh (an increase of nearly 4 per cent.) was generated by the Bunnerong "A" and "B" plants. Work in connection with the completion of Section "B" proceeded during the year, and modifications were made to the boiler plant by the contractors with a view to improving steam purity, furnace temperature conditions, emission of dust from boiler casing, performance of furnace hoppers and the ash handling plant. Delays due to non-arrival of materials impeded the work of rearranging the 33-kV switchgear.

For the Pyrmont power station reconstruction scheme an order was placed for 33-kV switchgear and tenders were invited for a 430,000-lb.-per-hr. (m.c.r.) steam generating unit and a 50,000-kW turbo-alternator to operate at 1,200 lb. per sq. in. and 925 deg. F. The plant is scheduled for completion by December, 1945.

Financially, the Council had to face rising costs of coal and stores, increases in wages and such abnormal expenditure as war damage insurance and the cost of A.R.P. but the year closed with a credit balance (although a very slender one). This was achieved without any increase in charges. The total revenue of the undertaking was £3,836,824 and expenditure £3,836,755, leaving a balance of £69.

The steady decrease during the past decade in the average price per kWh sold continued last year, when the figure fell from 1·155d. to 1·145d. (1·169d. including other income). On the other hand average costs rose from 1·121d. to 1·169d. Of the increase, 0·005d. was due to the higher cost of fuel (£1 3s. 4d. as compared with £1 2s. 7d. per ton).

Details of power station performance show that the thermal efficiency of Bunnerong "A" (on kWh sent out) was 19·28 (against 19·91) per cent. and of Bunnerong "B" 25·00 (25·29) per cent. At the "A" station 1·456 (1·428) lb. of coal was consumed and 10·98 (10·82) lb. of steam used per kWh generated, the average gross BThU per lb. of coal as fired being 11,650 (11,540). Similar data for the "B" station were 1·093 (1·079) lb. of coal; 9·27 (9·13) lb. of steam; and

11,780 (11,830) BThU. The maximum demand on the "A" station dropped from 151,000 to 144,800 kW while that on the "B" station increased from 92,000 to 104,200 kW. The system m.d. was 215,800 kW (against 217,800 kW) and the load factor consequently improved from 46·5 to 48·8 per cent.

In May last year an agreement was signed with the Electric Light and Power Supply Corporation, Ltd., governing the interchange of power.

The part of the report dealing with the Installation Inspection Branch records that 39,718 inspections of consumers' installations were made (excluding periodic visits). Many cases of very bad installation work and other breaches of the Gas and Electricity Act were dealt with. Ten people were prosecuted and convictions were recorded.

E.P.E.A. Reorganisation Plan

Views of London Members

AT a meeting of the London Technical Group of the Electrical Power Engineers' Association on October 11th, presided over by Mr. Sichall, Mr. W. Oswald (Wimbledon) who was one of the seven members of the committee responsible for drawing up the Association's post-war plan for the reorganisation of the electricity supply industry, opened a discussion on the plan.

Mr. Oswald outlined the history of legislation affecting the supply industry, quoting largely from the McGowan Report. He spent some time on the E.P.E.A. credentials and thought the *Electrical Review* unkind in criticising the necessity for them to issue a report. He attempted to answer the point raised by a member's letter in the *Electrical Review* that the report had not been submitted to members, by saying that reconstruction suggestions were called for in the *Electrical Power Engineer* in October, 1942, when the Committee started work. The Council felt that this was a better course than having a draft report discussed at district meetings and then redrafted before publication. Mr. Oswald then went through the report point by point.

A Healthy Industry

Before declaring the discussion open, the chairman took a vote regarding further technical group meetings, and, there being an overwhelming vote in favour, promised that the reading of papers would be arranged as soon as possible.

There were more "bricks" than "bouquets" in the contributions to the discussion. One speaker pointed out that State control would inevitably lead to Civil Service bureaucracy. Another said he was surprised that not a single crutch was to be seen in the hall, after reading and hearing of the unhealthy state of the supply industry. He stressed how healthy the industry really was and how little it needed the drastic attention which was advocated in the report.

A third speaker stressed the importance of Part 2 of the report (concerning personnel) and was told that this could not be expected for probably another year. A request for the names of the seven members of the Post-War Planning Committee was refused.

A strongly critical speech made by an important member earned the first round of applause. He stressed that the plan was not an Association plan, but that of a group of seven members, who seemed to have a particular political bias—in fact the report was a typical political plank and not an engineering report at all. It was just a collection of unsubstantiated statements and statements of an opposite kind could be made with greater truth. For instance, private enterprise had done all the pioneering from 1882 onwards and was still doing it in the rural field.

A member of the Electricity Commissioners' staff stressed the need for caution in adopting such a revolutionary plan as this, especially when it was unnecessary, judged by the rapid strides the industry was making when contrasted with other utilities. He also stressed how high the saturation was throughout the country (rural and urban areas alike) and how important the *rate* of progress was, and especially its effect on employment and the labour position in general.

Another speaker stressed the present high operating efficiency of the generating stations and how ownership by the Central Electricity Board could very well involve higher costs—especially in distribution which would have to carry the whole of the present managerial expenses. He criticised the "equating of tariffs" idea, and referred to the telephone service which had zoned charges.—G.O.M.

Result of I.E.E. Appeal

THE Committee of the Benevolent Fund of the Mersey and North Wales (Liverpool) Centre of the I.E.E. decided, due to war conditions, not to organise the customary golf competition this year in support of the Institution Benevolent Fund but instead to make an appeal to all members and also to friends and business firms who for a number of years have supported the local effort. As a result of this appeal the Committee has forwarded a cheque for £150.

Practical Education

A Craft Selection School

A RECENT development of the Brush Electrical Engineering Co.'s scheme for educating and training engineers was described at a one-day convention held last week attended by about seventy headmasters and masters of Leicestershire schools from which most of the company's trade apprentices are drawn. To make full use of special aptitude for particular crafts, and to avoid "misfits," all boys before being indentured as trade apprentices now serve for six months in a new Craft Selection School. Here they receive from four to six weeks' instruction in each of the following trades :— Machining, fitting and assembly, armature winding, carpentry, welding and tin smithing.

Boys receiving instruction in field winding at the Brush Co.'s Craft Selection School

Boys are taught on the "quality first" principle and the work done in the school is ultimately passed through the works inspection department and used as standard components of the company's products.

Record books of their work are written up by the boys week by week and the instructors record the progress made. The school works on a shortened week of 44 hours and the boys "clock in" as in the factory and strict discipline is enforced with no smoking. Before completion of the full course the boys will have developed a preference for one of the crafts indicated and they are encouraged to cultivate this interest. After six months they are transferred to the works and started on the particular craft which is most suited to their natural abilities.

For the next six months they are regarded as probationary trade apprentices and during this time they receive further assistance in making a final choice of trade by attendance at lectures dealing with the company's various products given by senior apprentices or ex-apprentices. At the conclusion of this series of lectures those who have shown interest and aptitude during the apprenticeship period are given the opportunity of becoming indentured to the trade of their choice. All probationary apprentices and apprentices must attend classes either at the works school or Loughborough College for one day a week, and in addition one evening a week during the winter, special arrangements being made to excuse overtime. The subject taken for evening class work is largely optional. Apprentices who obtain the School Certificate may be offered special training to qualify them for one of the technical positions with the company.

Opening the conference, Mr. Alan P. Good, managing director, said that the company, having reviewed the Board of Education's proposals outlined in the White Paper on "Educational Reconstruction," had decided to put into force immediately many of the recommendations for the education of young persons without waiting for the Bill to become law after the war. By the new experiment of the Craft Selection School in trying to fit a ob to the individual rather than *vice versa* they were getting a more correct approach to the problem. The boys receiving the training would play an important part after the war, for if the country was to survive it must export goods of high-grade content and there must be good craftsmanship.

Mr. D. B. Hoseason, another director, said that progressive specialisation was the keynote throughout. As well as theory and practice, the scheme placed special emphasis on the development of personality. Trade apprentices could attain just the same positions as the student or college apprentices.

Other speakers included Dr. H. Schofield, principal of Loughborough College and Dr. A. P. M. Fleming, of the Metropolitan-Vickers Electrical Co.

COMMERCE and INDUSTRY

Salaries in Scotland. Instrument Patent Appeal.

Electricity Supply Wages

FROM the beginning of the first full pay period following October 1st, the war bonus paid to employees in the electricity supply industry was increased from 4½d. to 5d. per hour. The new rate will remain in force for six months. In making this announcement, the National Joint Industrial Council for the Electricity Supply Industry states that where in any district there is no express provision in the District Council's schedule dealing with the adjustment of the wage variations of apprentices, probationers or juniors, the bonus to be applied to such grades shall be an amount that will maintain their present percentage relationship to the adult rate for the appropriate grade.

The bonus is to be applied in full to all zones, notwithstanding the fact that in some cases it will disturb the percentage relationship between the zone rates, the reason being that the grounds for the granting of the bonus are common to all zones.

Scottish "Chiefs'" Salaries

A conference of Scottish local authorities owning electricity undertakings held last July rejected, by eleven votes to two, a proposal that the salaries of electrical engineers and managers should be based on the output of the undertakings which they served. This was mentioned at a meeting of Inverness Town Council when a letter was read from the Associated Municipal Electrical Engineers with regard to the salary to be paid to the successor to the late Mr. G. C. McLean. Provost MacKenzie recalled that at the conference the authorities who opposed the output basis included Glasgow, Edinburgh, Paisley and Dundee. These and other authorities maintained that salaries should be graded according to the position.

The Town Chamberlain reported that in accordance with the agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers, the salary applicable to the position of electrical engineer and manager at Inverness would be approximately £700 per annum, rising to £824 in three years. The Council fixed the salary at £650, rising by annual increments of £50 to £800, plus free supply of electricity.

Export Training

The new syllabus of education which has recently been issued by the Institute of Export for the training of the personnel which will in future be charged with the conduct of the nation's overseas trade is intended to form a basis for training to be given at evening institutes throughout the country, and classes have already been arranged in London and Birmingham. The Institute has also arranged for a series of lunch-time lectures (in the Merchants' Hall, St. Mary Axe, E.C.3 on Mondays, Tuesdays and Thursdays during November and December) which will not only provide valuable information to young students, but may serve as "refresher courses" for the more advanced. The first lecture will be given on November 1st at 1.20 p.m., and Mr. Harcourt Johnstone, M.P., Secretary to the Department of Overseas Trade, has consented to attend in order to inaugurate the series.

There are to be twenty-four lectures covering all aspects of export trade. The lecturers are Messrs. E. F. Stevens, J. A. Dunnage and W. W. Syrett. Applications for tickets for the course should be sent to the Secretary of the Institute, Royal Empire Society Building, London, W.C.2, before October 26th.

Codes of Practice

In the Second Report of the Codes of Practice Committee for civil engineering, public works building and constructional work (Stationery Office, 3d. net) the progress made in drafting the building codes set out in the First Report is described. It states that matters to be included in the classification code will include an indication of suitable temperatures to be maintained in various parts of a building according to expected occupancy. It will classify various site conditions in terms of severity of exposure as this affects the heat demand, and will lay down guiding principles as to the amount of heat insulation which should be provided in the building structure with different heat demands. The Code will also indicate the assumptions to be made with regard to intensity of illumination, whether daylight or artificial, for various occupancies.

P.V.C. Cables for Ships and Miners' Lamps

The British Standards Institution has published a supplement to B.S. 883 (Cables for Use on Ships) dealing with the use of polyvinyl-chloride-compound cables as an alternative to rubber-insulated cables. This supplement follows closely the lines of the supplement recently issued in connection with B.S. 7 (Rubber-Insulated Cables for General Use). The supplement is contained in P.D. 149 which also sets out a number of amendments to the Specification for rubber- and paper-insulated cables for use in ships, these changes being necessary to meet the present position regarding the availability of various materials. Copies may be obtained from the British Standards Institution, price 2s. (post free). Purchasers should quote the reference P.D. 149.

The use of P.V.C. cables has been approved of by Lloyd's Register of Shipping, provided they are made and installed in accordance with tentative amendments to the Society's rules for electrical equipment. The latter are set out in Notice No. 1805, including notes that may assist in correct application and the avoidance of unsuitable situations, particularly in respect of high local and ambient temperature. P.V.C. cables must not be used at more than 250 V, but current-carrying ratings remain the same as for rubber-insulated types.

The Ministry of Fuel and Power has informed the manufacturers of electric cap lamps approved

under Section 33 of the Coal Mines Act, 1911, that flexible cables sheathed with polyvinyl chloride are acceptable in place of rubber-sheathed cables for use with all such types of lamp.

Electrical Patent Appeal

In the Court of Appeal on October 12th the Master of the Rolls and Lords Justices Luxmoore and du Parcq delivered their reserved judgment in the appeal by the Automatic Coil Winder & Equipment Co., Ltd., from a judgment of Mr. Justice Uthwatt on February 2nd last in favour of Taylor Electrica lInstruments, Ltd. (*Electrical Review*, February 12th, p. 224). Appellants asked that the judgment should be wholly set aside.

In the Chancery action plaintiffs sought an injunction restraining the defendants from infringing their letters patent No. 423199 by making, selling, offering for sale, using or otherwise dealing with electrical measuring instruments constructed substantially in accordance with any of their claims. The plaintiffs alleged that the defendants had infringed their patent by the sale of "Taylor Model 810."

Defendants challenged the plaintiffs' claim and pleaded that the patent was invalid on the ground that it was not novel and prior publication. They also maintained that the invention was obvious and did not involve any inventive step.

The Master of the Rolls, in giving judgment, said that several questions arose in this appeal. It was suggested that if the claim that the patent was invalid on the grounds alleged was established, then the patent ought to be revoked. His Lordship agreed with that view. Mr. Justice Uthwatt had held that the patent was invalid on the ground that it had been anticipated by prior common knowledge and that it had lacked inventiveness. He had read very carefully the evidence of Dr. Eccles and in his view that established the respondents' case. The appeal would therefore be dismissed with costs.

Lords Justices Luxmoore and du Parcq agreed.

Electric Transport

The future importance of electric transport is recognised by the *Automobile Engineer*, which is publishing in November an extra issue devoted to the subject. The situation from the point of view of national fuel policy will be surveyed, and various aspects of the trolley-bus and electric battery situation will be reviewed. The issue will contain detailed descriptions of typical trolley-bus, and electric battery chassis. It will deal with the latest developments in batteries and battery charging, and the influence these will have upon range or mileage, and hence upon the electric motor car for certain types of private service.

Institute of Refrigeration

The tendency to improve the status of the technician in modern industry is illustrated by the decision of the British Association of Refrigeration, at its forty-fourth annual meeting in London, to include in its constitution a qualified class of technical membership, attainable by examination on the lines of the major engineering institutions. At the same time it was decided to change the Association's name to the Institute of Refrigeration, both changes take effect on March 26th, 1944.

The president, Dr. S. F. Dorey, and the Executive Council, are now engaged in the foundational arrangements. In refrigerating practice, which is an essential factor in modern industrial life, there are mainly three branches of technician, *viz.*, engineers, insulation specialists and biological experts in the food trades, and for each of these sections the entrance examination must ensure an adequate rank of technician. Associated with this technical class of member in the amenities of the new Institute will be, as formerly, that wide range of members of the refrigerated shipping, importing and produce-handling industries who, in allied trades, are disciples of the modern and progressive branch of engineering known as "mechanical refrigeration."

More Salvage Stewards Needed

Salvage is still vital to the war effort, and to ensure the maximum recovery more staff salvage stewards are urgently needed, states the Ministry of Supply. Employers with five or more persons on their staffs are asked to appoint such officers. Throughout the country staff salvage stewards, organising and supervising the collection and disposal of salvage on the premises of their firms, are contributing vital raw materials for the production of munitions. The present aim is to increase the total number from the 40,000 now registered to 100,000. Full particulars of the scheme can be obtained from the Directorate of Salvage and Recovery, Ministry of Supply, Berkeley Court, Baker Street, London, N.W.1.

Railway Radio-Telephone Tests

Successful tests have recently been carried out with radio-telephone apparatus designed by Rediffusion, Ltd., and the L.N.E.R. to enable the engine crews and guards of goods trains to converse during the journey. For some time the railways have realised the advantages of intercommunication facilities on moving trains and between moving trains and ground staff, and as it is not practicable in either case to effect this by means of direct wire, radio methods have been tried. The tests were carried out on a goods train of 52 wagons between Hornsey and Hitchin, the apparatus being of such robust design that it withstood continuous vibration, and of a simplicity making it suitable for operation by anyone used to an ordinary telephone. This new method of intercommunication on moving trains may not come into full use until after the war, but the experiments show that even in the midst of present day problems useful work is being done by the railways in planning for post-war efficiency.

Ekco Publicity

A large-scale outdoor publicity campaign by E. K. Cole, Ltd., has for some months been in progress, and there is now an impressive display of carefully chosen sites to obtain constant attention in important thoroughfares and strategic positions in main railway stations. Both radio and lamps are featured, and this serves as a reminder that while radio supplies are scarce there is turnover to be secured in lamps. Press advertising is also being employed, using over fifty national and provincial papers and popular weekly journals. Lamp trade

advertising is also being conducted on an extensive scale in a large number of selected journals covering industries, etc., representing large scale users of lamps. For window displays "Ekco" still have available a useful range of sales aids. Allocation of these is strictly rationed but supplies are sufficient to provide effective window displays. A new lamp trade list is also in preparation and will be available at an early date.

Post-War Technical Education

An expenditure of £10,000,000, spread over the first five years after the war, is visualised by a sub-committee of the Parliamentary and Scientific Committee for the provision of buildings and equipment for scientific and technical education. This expansion of facilities at universities and technical colleges should be accompanied by increased staffs and improved payment of teachers. It is considered that the present system of State bursaries and engineering cadetships should be continued and developed to cover a wider field. The Treasury grant to the universities should be increased from the present £2,250,000 to £6,000,000 or £7,000,000 and there should be increased facilities for part-time technical training and greater assistance to young people in industry to enable them to take full-time or part-time courses.

Rubber Supplies

Mr. O. Lyttelton, the Minister of Supply, told the House of Commons last week that this country was able to meet all its rubber requirements during the war from crude rubber and still export a substantial surplus. Later, the Minister supplemented this statement by saying that it assumed the continuance of the present rate of reclamation of scrap and economy in use. Any surplus of crude rubber must be shared with our Allies for purposes in which natural rubber could not be replaced by synthetic material. Mr. Lyttelton further said that the United States was sending us very valuable supplies of synthetic rubber.

Economical Torch Bulbs

As a means of prolonging the life of torch batteries "half-current" bulbs are being supplied to the public. The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2, says that among these is a 2·5 V 0·15A size to replace the ordinary 0·3A bulb. The use of the new bulbs will practically double the life of batteries and as the consumption of these is in the neighbourhood of 100 million a year it is obvious that the saving of labour and material will be very substantial.

Flex for Appliances

In a letter to the *Electrical Review* of October 15th, Mr. H. B. Tucker complained of the shortness of the flexible cord attached to domestic appliances and suggested that this was a result of Government control of cables. The Ministry of Supply points out, however, that there is no Government Order controlling this matter, but there is general agreement among the manufacturers of domestic appliances as to the minimum lengths which, from their own experience, and that of distributors and retailers, are adequate in the majority of cases under present conditions. These lengths have accordingly been adopted as wartime standards but, in order to avoid the sort of thing to which Mr. Tucker refers, the arrangement is flexible in that longer lengths may, and will be, supplied provided that the customer can satisfy the supplier that the particular circumstances are such as to require them.

N.Z. Radiator Sales Controlled

The sale of electric radiators and elements without a permit is prohibited in New Zealand by the Electric Radiator Order, 1943. Permits must be obtained from the chief executive officer of the local supply undertaking. The Order does not apply to hospitals or similar establishments. The Minister of Supply and Munitions, in a statement on the Order, explained that for some months the use of resistance wire in the manufacture of electric radiators and other appliances had been prohibited in accordance with a scheme initiated by authorities in the United Kingdom and the United States, from whom supplies were obtained. It had become advisable to conserve stocks of unsold radiators for necessitous cases and also to prevent an unnecessary increase in the demand on the fully extended supply system.

Research in New Zealand

A new development is being set up in the School of Engineering at Canterbury (N.Z.) University College to undertake work of an investigational character in the electrical and electronic fields. The *New Zealand Electrical Journal* reports that the work, mainly post-graduate, will be carried out under the direction of the senior lecturer in electrical engineering, Mr. T. R. Pollard, who is now in charge of special development work for the Department of Scientific and Industrial Research.

Scottish Hydro Board Loan

To meet its preliminary expenses and for the payment of interest on money to be borrowed before the commencement of trading operations, the North of Scotland Hydro-Electric Board is to borrow up to £100,000. This is the first loan sanction made by the Secretary of State for Scotland with the approval of the Treasury. The Board's Act provides for a Treasury guarantee for loans up to a total of £30,000,000.

Public Transport Association

At the monthly meeting of the Public Transport Association held on October 14th, a memorandum on vehicle dimensions prepared by a technical committee of representatives of the Society of Motor Manufacturers and Traders and the operators was approved and it now awaits the approval of other constituent bodies. A suggestion by this committee that the various organisations might set up a small technical sub-committee of manufacturers and operators to advise on technical matters was also approved.

R.M.A. Telephone Number

The telephone number of the Radio Manufacturers' Association, 59, Russell Square, London, W.C.1, has been changed to Museum 6901-5.

Trade Announcement

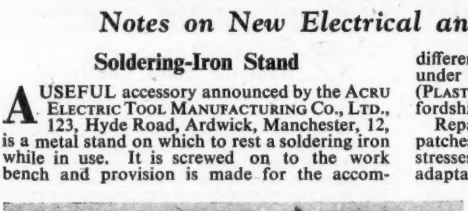
On November 1st, Multicore Solders, Ltd., are moving from Bush House to Commonwealth House, New Oxford Street, London, W.1 (telephone: Chancery 5171/2).

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Soldering-Iron Stand

A USEFUL accessory announced by the ACRU ELECTRIC TOOL MANUFACTURING CO., LTD., 123, Hyde Road, Ardwick, Manchester, 12, is a metal stand on which to rest a soldering iron while in use. It is screwed on to the work bench and provision is made for the accommodation of a file, up to 1¼ by ¼ in. in size, which is securely fixed by two clips so as to enable the copper bit to be cleaned by rubbing it along the file without handling the latter. Operators may thus be induced to clean their irons more frequently through not having to change the iron from their right hand to the left in order to permit right-handed use of a cleaning file.



Soldering iron stand with bit-cleaning file

Brazing Materials

The latest addition to the range of alloys for low-temperature brazing offered by JOHNSON, MATTHEY & CO., LTD., 73, Hatton Garden, London, E.C.1, is a metal for bronze welding. It is supplied in the form of "Sibrods" which are used to fill a groove, or to build up a fillet, in a similar way to torch welding.

The molten alloy flows between closely fitting surfaces, so that it is not usual to bevel the edges of the parts to be jointed before they are fitted together. The relatively low melting point of this alloy (870 deg. C.) allows considerable latitude in jointing a variety of metals. The strength of mild steel butt joints made in this way is 28 tons per sq. in.

A slightly oxidising flame will minimise volatilisation of zinc, which might otherwise cause porosity of the weld, and will also induce quiet fluidity without sputtering, producing an evenly rippled seam. Before using these rods and strips they should be slightly heated and dipped into "Sibrod" flux powder, which may be made into a thick paste with water and applied to the surfaces to be brazed.

Rubber Vulcanisers

A range of electric vulcanisers for repairing the inner tubes of vehicle tyres, suitably channelled on the underside for reseating all types of differently shaped tube valves, is being marketed under the trade name of "Ultric" by KAUTEX (PLASTICS), LTD., Elstree Way, Elstree, Hertfordshire.

Repairs are effected flush on both sides, patches which may cause unequal stretching stresses being obviated. The machines are adaptable to the reclamation of a variety of other articles, temperature control having received particular attention to enable rubber that has begun to age to be cured at the lowest feasible limit.

Heat is regulated by a specially contrived McLaren non-magnetic thermostat which, in principle, may be represented as a flat triangle of forces momentarily in equilibrium; any slight increase of any one of the three forces causes the system to collapse, so opening or closing the circuit.

Two Bray "Chromalox" elements of 0·5 kW loading are in intimate contact with the underside of the platen, which is an inverted box casting upon a cast-iron base that also forms a bench bracket to which the vulcanising press is fixed. The latter consists of a central clamp fitted with a pressure screw actuated by a hand wheel. A three-core Reyrolle connector of the metal right-angle type is provided, all electrical portions being completely enclosed.

"Ultric" electric vulcaniser of Frost design, showing channel for reseating valves in position

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Australian Lighting Restrictions Relaxed.—The *Electrical Engineer and Merchandiser* reports that in the southern half of Australia screens may now be removed from street lamps and normal lighting restored, except where visible from the sea. Motor vehicle light hoods may also be dispensed with. Neon and other unnecessary external lights are still prohibited.

ELECTRICITY SUPPLY

Derby Bonus Scheme. Extensions at Bradford.

Barrow-in-Furness.—MODIFIED LIGHTING.—The Highways Committee has adopted the principle of low-intensity street lighting and has asked the borough engineer to report thereon.

Birkenhead.—LIVERPOOL APPLICATION OPPOSED.—At a recent meeting of the Electricity Committee it was decided to oppose an application by Liverpool Corporation, in conjunction with the Mersey Railway Co., for consent to give an electricity supply to the railway company, to be used for any purpose of the railway undertaking either within or without the area of the Liverpool Corporation.

Blackpool.—LOANS.—The Electricity Committee has obtained sanction to borrow £37,154 in connection with the transmission system and is seeking sanction to borrow £10,443 for cables and switchgear.

Bradford.—POWER STATION EXTENSIONS.—The Central Electricity Board's scheme for increasing the capacity of the Valley Road power station was approved by the Electricity Committee at a recent meeting, subject to the City Council's confirmation. It is estimated that the scheme will entail an expenditure of £1,000,000 and that it will be put in hand in 1948. It was explained that no extensions of buildings are contemplated, the intention being to replace certain plant by up-to-date equipment. This will involve the installation of two turbo-alternators and associated boiler plant operating at a pressure of 650 lb. per sq. in.

Coventry.—HOT WATER FROM POWER STATION.—According to the *Coventry Evening Telegraph*, a scheme now before the Re-development Committee contemplates the use of waste hot water from the power station, piped under the roads to the new city centre, for central heating purposes.

Derby.—BONUS SCHEME.—At the last meeting of the Corporation it was decided to agree to the Electricity Committee's proposals for the institution of a bonus scheme for all employees of the electricity undertaking, other than the chief electrical engineer. The bonus will be based on the gross profits, and the object of the scheme is to secure the full co-operation of all employees by giving them a direct incentive towards greater efforts, and so result in the more efficient operation of the undertaking.

In the report of the jubilee celebrations in our last issue we stated that Mr. Morgan proposed the toast of the Derby electricity undertaking. This was a printer's error, the toast being proposed by the Mayor, Alderman H. A. Hind.

Dorchester.—REPAIR OF HOTPLATES.—At a recent meeting of the Electricity Committee the borough electrical engineer (Mr. W. J. Smither) reported that it was now possible for the staff to repair cooker hotplates. This work was formerly carried out by the makers, but they were now unable to repair elements, he said.

Douglas (I. o. M.).—EXTENSION OF "STARLIGHTING."—The Highways Committee has considered the desirability of installing additional public lamps of the "starlight" type and has notified the Electricity Department of its willingness to approve an expenditure of £191 for the provision of 50 additional fittings.

Hull.—UNDERTAKING'S JUBILEE.—The general manager (Mr. D. Bellamy) reported to the Electricity Committee that this was the jubilee year of the undertaking, the ceremonial opening of the public supply of electricity having taken place at the original Dagger Lane premises in January, 1893. The Committee expressed the opinion that some attempt should be made to commemorate the occasion and left the matter to the chairman and the general manager.

DIRECTION FOR EXTENSIONS.—A formal direction has been received from the C.E.B. for the completion of arrangements for the extension of the Sculcoates power station by the installation of a 30,000-kW turbo-alternator set and two 190,000 lb.-per-hr. (m.c.r.) boiler units, together with the necessary buildings, cooling towers and civil engineering works, the plant to be ready for operation in September, 1948. He was authorised to enter into the preliminary negotiations.

SUPPLY TO WORKS.—The Commissioners have now consented to the Council affording a supply to G. & T. Earle, Ltd., at Wilmington Works. Mr. Bellamy reported to the Electricity Committee that negotiations for this supply, which commenced in 1939, were suspended for the war period, but in view of the large saving in fuel consumption which would be effected by the Council providing the supply, owing to the uneconomic operation of the consumer's own generating plant, it had been decided to proceed with the supply immediately. Terms and conditions for the supply had been agreed. The consumer's own generating plant would be available if required during peak-load hours and during any emergency period, and in return for this availability the Department would meet the expense of maintenance during the year and in addition pay all expenses of operation if and when the plant was run by the Department.

CHIMNEY LININGS.—The Electricity Committee is to renew the linings of five chimneys at a cost of £1,535.

AIR-RAID SHELTER INSTALLATIONS.—The City treasurer has informed the Finance Committee that the final cost of installing electric lighting and heating in 655 school air-raid shelters was £27,436, compared with the original estimate of £16,945. Of the increase £500 was attributable to alteration in design of the equipment.

LOAN.—The Electricity Committee has obtained sanction to borrow £1,139 for substation equipment, £11,689 for mains and plant, £2,116 for substations and £19,018 for plant and buildings.

Lichfield.—DISPARITY IN CHARGES.—Recently the Electricity Commissioners received a deputation from the Rural District Council regarding the differences in the charges made by the six undertakings which serve the rural district. As a result the Commissioners suggested that the undertakings concerned should give consideration to the possibility of securing some greater measure of uniformity in post-war years. At a

meeting of the Corporation Electricity Committee details of the charges made by the various undertakings were submitted and the Committee expressed full sympathy with the view expressed by the Commissioners, but noted that the charges made by the Corporation for electricity supplied to the rural areas were amongst the lowest.

INCREASE AGAIN WAIVED.—The Electricity Committee recommends that the war increase of 10 per cent. imposed in February, 1940, shall not be charged in respect of the December quarter. The increase was also waived in the March, June and September quarters.

ELECTRICITY FOR FARMS.—Consent has been obtained by the Electricity Committee for the erection of an overhead line to Weaverslake Farm, Yoxall, a Fringe Order for supply to Whitemere Farm, Yoxall, and sanction to borrow £380 in connection with the extension of farm electricity supplies. At a recent meeting of the Committee an inquiry was received from Mr. Riley for a supply to Tamhorn Farm and adjoining cottages and it was agreed to provide this if Mr. Riley contributed £1,000 towards the cost. The Committee is also to provide an electricity supply to Rough Farm, Fawley Farm, Rowley Farm and cottages adjoining Hamstall Ridware, the farmers having agreed to contribute £640 towards the cost.

SUPPLY TO WORKS.—The Electricity Committee has arranged terms for the provision of supply to the Midland Gravel Co., Ltd., at a proposed gravel works at Moneymore.

Manchester.—REPORT ON STREET LIGHTING.—The 1942-43 report on street lighting states that the installation of "star-light" fittings on all main roads has been completed and at March 31st last there were 4,824 gas and 4,064 electric fittings, making 8,888 in all. The expenditure on gas lighting was £20,826 and on electric lighting £35,643. These figures include maintenance of all plant and equipment, whether used or unused, and, in the case of electricity, £17,300 for interest and debt redemption in respect of pre-war installation.

Stretford.—STREET LIGHTING.—At a meeting of the Highways Committee the borough engineer submitted a comprehensive report on street lighting, with an estimate for extending the present system of "star lights" to the whole borough, but the Committee decided to take no further action in the matter.

Tonbridge.—RATE CONTRIBUTION.—Reporting on the past year's working of the electricity undertaking, Councillor R. Norton, chairman of the Electricity Committee, said that there was a balance of £910 of which it was recommended that £600 should be contributed to the rates. He paid a tribute to the electrical engineer (Major F. Springate) and his staff for the work they were doing under difficult conditions.

Watford.—FRINGE ORDER.—An application has been made by the Chesham Electric Light & Power Co., Ltd., for consent to a Fringe Order to supply premises in the Watford Corporation's area. The Corporation Electricity Committee recommends that consent should be given subject to safeguards, and having regard to the possibility of new legislation relating to the distribution of electricity or areas of supply and that the town clerk should place the matter before counsel if he deems it necessary.

Whitby.—PUBLIC LIGHTING IMPROVEMENT.—The electrical engineer has been authorised to prepare a post-war plan for improving the street lighting.

Overseas

Canada.—POWER SUPPLY SURVEY.—The great expansion in Canadian electric power supply since the beginning of the war is shown by figures and a chart appearing in a statistical summary just issued by the Bank of Canada. Perhaps the best indication of industrial activity is provided by figures showing the consumption of "firm" power produced by central electric stations. The daily average reached 81·1 million kWh in May of this year, and was near this level in June with 80·8 million kWh. As compared with the pre-war year of 1938, when the daily average was 39·6 million kWh, firm power consumption has more than doubled. In 1926 it was 21·4 million kWh and in 1929 31·3 million kWh.

India.—POWER RESTRICTION ORDER.—It is reported in the *Indian Textile Journal* that the Central Electric Power Control Board, New Delhi, has issued an Order empowering certain electricity undertakings to discontinue supply to consumers (other than distributing licensees) who, without a permit from the appropriate authority, exceed the authorised limit or the highest m.d. during the twelve months ended January 31st, 1943, or have connected load beyond that notified. An undertaking may also discontinue supply to any consumer if so directed by the appropriate authority. This step has been taken as it has been found that many generating station loads have reached the maximum safe levels.

TRANSPORT

Manchester.—TROLLEY-BUSES.—The Transport Committee is seeking permission to extend the period for the commencement of certain trolley-bus routes in Wythenshawe and Trafford Park.

Newcastle-on-Tyne.—PROPOSED TROLLEY-BUS SERVICE OVER TYNE BRIDGE.—The City Council is contesting a suggestion by the Ministry of Transport that the promotion of a Provisional Order to run trolley-buses over the Tyne Bridge into Gateshead should be postponed until after the war. The Corporation's point of view that an Order should be made now is supported by the Felling and Gateshead Councils into whose areas the trolley-buses would run.

Mining Engineers

THE opening meeting of the West of Scotland Branch of the Association of Mining Electrical and Mechanical Engineers was held at the Royal Technical College, Glasgow, on October 9th, when Mr. Herbert E. Murray presided over a fair attendance. At the commencement of the proceedings Mr. Murray made sympathetic reference to the death of Mr. J. H. W. Diaper, general secretary of the Association. After the admission of ten new members the meeting was opened for "Questions and Answers," and many practical problems were discussed. The next meeting will be held on Saturday, November 13th, when a paper on "Pumps and Pumping Problems" (illustrated) will be read by Mr. W. Boyle.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The **Para Electric Railways & Lighting Co.** reports an increase in gross revenue from £137,688 in 1940-41 to £162,455 in 1941-42. After meeting all expenses, including renewals and amortisation there was a deficit of £25,140 (against £18,420) and the deduction of London expenses increases this to £33,206, making the total debit balance £68,218. Arrears of interest on the 6 per cent. debenture stock now stand at £365,807 and those on the preference shares at £380,250. The board hopes to suggest to the appropriate Brazilian Government Department the possibility of enlisting active support in the working of the Para undertaking. The President's attention has also been drawn to the existence of debts totalling £210,300 due to the company from the Para Municipality. The operating managers, White, Drummond & Co., have given notice to determine their agreement with the company. The board has assumed undivided responsibility for management and has co-opted new members with technical knowledge and acquaintance with Brazilian conditions.

Electric & Musical Industries, Ltd., in a preliminary statement, reports a profit for the year 1942-43 of £174,357 as compared with £153,560 for the preceding year. The first and final ordinary dividend is 6 per cent., less tax (same), plus a bonus of 2 per cent., less tax. This is the first bonus since the 2½ per cent. paid for 1934-35.

The **Calcutta Electric Supply Corporation, Ltd.**, is again paying an interim ordinary dividend of 3 per cent., tax free.

The **Adelaide Electric Supply Co., Ltd.**, has announced a final dividend of 5 per cent., making 10 per cent. for the year (unchanged).

The **Skefko Ball Bearing Co., Ltd.**, is paying an interim dividend of 4d. tax free, per 5s. ordinary stock unit (same).

The **Ever Ready Trust Co., Ltd.**, has declared an interim dividend of 3 per cent. on its ordinary stock and deferred shares (same).

The **Electrical Finance & Securities Co., Ltd.**, announces the payment of an interim dividend of 4 per cent., as last year.

The **British Thermostat Co., Ltd.**, is again paying an interim dividend of 7½ per cent.

W. B. Dick & Co. (Holdings), Ltd., has declared an interim dividend of 4 per cent. (same).

Chadburn's (Ship) Telegraph Co., Ltd., is paying a dividend of 6 per cent., with a bonus of 4 per cent. for the past year (same).

The **Renold & Coventry Chain Co., Ltd.**, reports a net profit of £97,461 for 1942-43 (against £100,739). The final ordinary dividend is 7 per cent., maintaining the year's distribution at 10 per cent.

New Companies

General Railway Signal Co., Ltd.—Private company. Registered October 13th. Capital, £100. Objects: To carry on the business of railway signalling engineers, etc. Subscribers: D. M. Forbes, 106, Shaftesbury Avenue, W.1, and E. Edwards, 25, Stockford Road, S.W.16. Solicitors: Allen & Overy, E.C.3. Registered office: 11, Ironmonger Lane, E.C.2.

Hardy & Tarran, Ltd.—Private company. Registered October 9th. Capital, £5,000. Objects: To acquire the business of an electrical engineer carried on by A. Hardy at Lambert Street, Hull, etc. Directors: F. P. Tarran, Springfield, Hull Road, Cottingham, A. H. C. Hardy, 3, Torrington Street, Hull, and R. G. Tarran, The Wolds, Beverley High Road, Hull. Registered office: 140, Clough Road, Hull.

Companies' Returns

Statements of Capital

Chepstow Electric Lighting & Power Co., Ltd.—Capital, £27,000 in £1 shares. Return dated April 21st (filed May 1st). All shares taken up. £23,095 paid. £3,905 considered as paid. Mortgages and charges: Nil.

Cox-Cavendish Electrical Co., Ltd.—Capital, £6,000 in £1 shares (all ordinary). Return dated June 20th (filed September 13th). 4,344 shares taken up. £4,344 paid. Mortgages and charges: Nil.

A. P. Lundberg & Sons, Ltd.—Capital, £30,000 in £1 shares. Return dated June 2nd. All shares taken up. £30,000 paid. Mortgages and charges: £10,000.

Mortgages and Charges

F. D. Sims, Ltd.—Particulars filed of £20,000 debentures authorised July 26, 1943, charged on the company's undertaking and property, present and future, including uncalled and unpaid capital, the whole amount being now issued.

Grimston Electric Tools, Ltd.—Satisfaction in full on September 24th, 1943, of debenture dated July 3rd, 1933, and registered July 7th, 1933, securing £1,000.

Liquidations

The Radio Service Co. (Reading), Ltd.—Meeting, pursuant to Section 245 of the Companies Act, 1929, on Wednesday, November 17th, at 185-188, High Holborn, London, W.C.1, to receive an account of the winding-up by the liquidator, Mr. A. W. Hunter.

Bankruptcies

W. T. Dalton, wireless engineer, 62, East Street, Horsham, Sussex. Order for discharge dated September 16th, 1943. Bankrupt discharged subject to his consenting to judgment being entered against him by the Official Receiver for £50, and £1 10s. costs of judgment.

W. S. Scott (West End Radio), radio engineer, 452, West Road, Newcastle-upon-Tyne.—Last day for receiving proofs for dividend, November 2nd. Trustee, Mr. A. K. Ferguson, Gibb Chambers, Westgate Road, Newcastle-upon-Tyne, Official Receiver.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets have come to one of those periods when experience and instinct are alike baffled in their attempt to forecast the immediate future. Prices of stocks and shares in which any kind of speculative account exists are lower on the week. Business has fallen away to a marked extent. Exuberant optimism has given place to a cautious restraint. Stock Exchange members, talking over the matter amongst themselves, declare that the markets are suffering from a fit of financial indigestion brought on by a too-eager appetite for securities already standing at high prices. In the purely investment sections the declines are of no particular account; amongst the more speculative markets, the effect of selling has made its influence apparent. Home Rails are better: the buying is more particularly directed to the gilt-edged stocks.

Price Movements

Most of the other price changes are downward. British Insulated lost 2s. 6d. and Callender's 1s. 3d. Henley's at 25s. 3d. xd. have recovered the dividend. Hopkinsons at 62s. xd. are also unchanged by the deduction. Ever Ready at 39s. 6d. and Siemens at 34s. 9d. are both 6d. lower. Mather & Platt have gone back to 51s. 3d. De la Rue at 8¼ have dropped by ⅛. Veritys are 3d. down at 7s. 9d. Pinchin & Johnson, unaffected by the announcement of an interim dividend of 2½ per cent., remained at 36s. cum dividend and Rawlplugs were left at 8¾ cum the 10 per cent. interim dividend. At 16s. Burco are a few pence down.

The Home electricity supply market is quiet. Scottish Power at 38s. 6d. show a gain of the pence, and Electric Supply Corporation are similarly better. London Power 5 per cent. debenture fell a point to 103½. In the overseas group, Jerusalem Electrics at 28s. xd. lost 2s., an increase in the dividend having been expected. Palestine "A" at 41s. are lower in sympathy with the fall in Jerusalem Electrics. Of the Indian shares, Cawnpores at 35s. 6d. make the best showing with 1s. gain. Tokyo Electric sixes at 22 are lower.

Electric & Musical

After dropping to 26s., the price of E.M.I. recovered to 26s. 6d. upon declaration by the company of a dividend and bonus making together 8 per cent. for the past year. This is a trifle better than caution had anticipated, and the figures given in the preliminary statement were regarded as satisfactory. The yield comes to a meagre 3 per cent. on the money. From this it is obvious that the supporters of the shares look to the future to provide them with a reward for their patience. Other shares in the radio group show little change on the week. On the whole, the inclination has been to let prices droop, business being to seek. Cossors have gone back 1s. to 23s. and Philcos are slightly easier at 14s. 3d.; the other changes in this section are of no consequence.

Cable and Telephone

Cable & Wireless 5½ per cent. preference at the price of 110 pays a level 5 per cent. on the money. The ordinary stock has eased off to 77½. A small rise lifted Oriental Telephones to 45s. 6d. Telephone Properties ordinary are 1s. higher at 16s., Venezuelan companies having come into favour. Hopes are heard of a possible dividend being declared: the last was paid three-and-a-half years ago. At half a guinea, Telephone Rentals are sixpence down, and Telephone Manufacturing went back 1s. to 11s. 6d.

Canadian Utilities

Montreal Light, Heat & Power shares have fallen 5¾ on the proposal to expropriate the company. The intention is said to be to provide the people of the Province of Quebec with cheaper power. The matter was raised ten days ago by the Premier of the Province. It may be recalled that in the company's report for 1941, circulated over here about a year ago, attention was called to the power of the Canadian Minister of Lands and Forests to acquire, by mutual agreement or by expropriation, the undertaking of the Montreal company's subsidiary, the Beauharnois Light, Heat & Power Co. Apparently Quebec wants to gain possession of the Montreal Light, Heat & Power concern; and, judged by the forecast made by the Premier, arrangements are likely to be made for this purpose.

There is a quotation for the shares in London, as our weekly lists have shown for several years past, but purchases on this side are not allowed, sales only being permitted under the Defence Regulations. The company's bonds were requisitioned by the British Treasury in 1941. Shawinigan shares at 16½ are 2½ points lower as a result of the Montreal suggestion.

Atlas Electric

At the meeting of the Atlas Electric & General Trust last week the chairman refused to consent to the appointment of a committee for the purpose of investigating the present position of the Trust. In the course of his speech, Mr. Donovan Touche, who was in the chair, referred to the valuation made on August 30th last, when the market quotations for the securities then held by the Trust showed a surplus of £279,000 over their book cost. He said that the operations of the Montevideo tramway system had been less unfavourable than for a long time past, and

(*Continued on page* 560)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Oct. 19	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	59/6	+6d.	4 4 6
British Power and Light	6	7	32/6	..	4 4 9
City of London	7	7	28/–	..	5 0 0
Clyde Valley	8	8	39/6	..	4 1 0
County of London Edmundsons:	8	8	40/6	..	3 19 0
7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	28/6	..	4 4 3
Elec.Dis.Yorkshire	9	9	44/–	..	4 1 10
Elec. Fin. and Securities	12½	12½	53/–	..	4 14 4
Elec. Supply Corporation	10	10	46/–	+6d.	4 7 0
Isle of Thanet	Nil	Nil	18/–	..	—
Lancs. Light and Power	7½	7½	34/6	..	4 7 0
Llanelly Elec.	5½	6	25/6	..	4 14 1
Lond.Assoc.Electric	4	3	23/6	..	2 11 0
London Electric	6	6	27/6	..	4 7 3
London Power Red. Deb.	5	5	103½	–1	4 16 7
Metropolitan E.S.	8	8	41/–	..	3 18 0
Midland Counties	8	8	39/–	..	4 2 0
Mid. Elec. Power	9	9	42/6	..	4 4 9
Newcastle Elec...	7	7	31/–	..	4 10 5
North Eastern Elec.: Ordinary	7	7	32/6	..	4 16 2
7% Pref.	7	7	33/6	..	4 3 7
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	10	..	—
Northmet Power: Ordinary	7	7	38/–	..	3 13 8
6% Pref.	6	6	29/6xd	+3d.	4 0 0
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	38/6	+6d.	4 4 4
Southern Areas	5	5	22/–	..	4 10 11
South London	7	7	26/6	..	5 5 8
West Devon	5	5	23/6	..	4 5 0
West Glos.	4½	3½	24/–	..	2 18 4
Yorkshire Elec.	8	8	41/–	..	3 18 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	7/9	..	—
Calcutta Elec.	7*	6*	38/–	..	3 3 2
Cawnpore Elec.	10	10	35/6	+1/–	5 12 8
East African Power	7	7	33/6	..	4 3 7
Jerusalem Elec.	7	5	28/–xd	–2/–	3 11 5
Kalgoorlie (10/–)	5	5	10/–	..	5 0 0
Madras Elec.	4*	Nil	22/6	..	—
Montreal Power	1½	1½	22	–5½	6 16 4
Palestine Elec."A"	4*	5*	41/–	–6d.	2 8 10
Perak Hydro-elec.	6	7	14/–	..	—
Shawinigan Power	83cts.	90cts.	15½	–2½	—
Tokyo Elec. 6%	6	6	22	–1	—
Victoria Falls Power	15	15	4½	..	3 9 7
Whitehall Inv.Pref.	—	—	25/–	..	4 0 0

Company	Dividend Previous	Dividend Last	Middle Price Oct. 19	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955–60 (Civil Defence)	—	3	99½	..	3 0 4
1955–75	5	5	113½	..	4 8 0
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	102	..	3 8 8
1974–94	3½	3½	98½	..	3 6 0
LondonElec.Trans. Ltd.	2½	2½	97	..	2 11 3
London & Home Counties 1955–75	4½	4½	111	..	4 1 1
Lond.Pass.Trans.:					
A	4½	4½	115½	..	3 18 0
B	5	5	116½	+1	4 5 10
C	2½	3	69	..	4 7 0
WestMidlandsJ.E.A. 1948–68	5	5	109	..	4 11 9
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	115½	..	5 4 0
Def.	1½	1½	27½	..	5 9 1
Anglo-Portuguese	8	8	24/6	+6d.	6 10 8
Cable & Wireless:					
5½ Pref.	5½	5½	110xd	..	5 0 0
Ord.	4	4	77½	–½	5 3 3
CanadianMarconi$1	Nil	4cts.	9/6	–3d.	—
Globe Tel. & Tel.:					
Ord.	8½*	5*	38/–	..	2 12 8
Pref.	6	6	29/–	..	4 2 9
Great NorthernTel. (£10)	Nil	Nil	23½	..	—
Inter. Tel. & Tel.	Nil	Nil	16	..	—
Marconi-Marine	7½	7½	32/9	..	4 11 7
Oriental Tel. Ord.	16	10	45/6	+6d.	—
Telephone Props.	6	Nil	16/–	+1/–	—
Tele.Rentals (5/–)	10	10	10/6	–6d.	4 15 3
Traction and Transport					
Anglo-Arg.Trans.:					
First Pref. (£5)	Nil	Nil	3/6	..	—
4% Inc.	Nil	Nil	12	..	—
Brit.Elec.Traction:					
Def. Ord.	45	45	1125	..	4 0 0
Pref. Ord.	8	8	175	..	4 11 5
Bristol Trams	10	10	52/–	..	3 17 0
Brazil Traction	$1	$1¼	29¼xd	–1½	—
Calcutta Trams	5½	6½	41/–	..	3 3 5
Cape Elec. Trams	5	6	24/–	..	5 0 0
Lancs. Transport	10	10	44/3	..	4 10 4
Mexican Light: 1st Bonds	5	5	107½	+1	4 13 0
Rio 5% Bonds	5	5	105½	..	4 14 9
Southern Rly.: 5% Prefd.	5	5	76	+½	6 11 7
5% Pref.	5	5	110	+1½	4 11 0
T. Tilling	10	10	58/–	+1/–	3 9 0
West Riding	10	10	43/–	..	4 13 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Oct. 19	Rise or Fall	Yield p.c.
Equipment and Manufacturing					
Aron. Elec. Ord. .	10	15	55/–	..	£ s. d. 5 9 1
Assoc. Elec. :					
Ord.	10	10	50/6	..	3 19 0
Pref.	8	8	38/–	..	4 4 3
AutomaticTel.&Tel.	12½	12½	59/6	..	4 4 0
Babcock & Wilcox	11	11	48/–	+6d.	4 11 7
British Aluminium	10	10	47/–	..	4 5 1
British Insul. Ord.	20	20	5½	–¼	3 14 4
British Thermostat (5/–)	18½	18½	19/–	..	4 17 4
British Vac.Cleaner (5/–)	15	30	27/6	..	5 9 1
Brush Ord. (5/–)	6	8	9/3	..	4 6 6
Burco (5/–) ..	15	15	16/–	–3d.	4 13 9
Callender's ..	15	20	5 1/16	–1/16	3 19 0
ChlorideElec.Storage	15	15	82/6	..	3 13 0
Cole, E. K. (5/–)	7	10	27/–	..	1 17 2
Consolidated Signal	17	24	5½	..	4 3 6
Cossor, A. C. (5/–)	7½*	10*	23/–	–1/–	2 3 6
Crabtree (10/–) ..	17½	17½	39/9	..	4 8 0
Crompton Parkinson Ord. (5/–) ..	20	20	26/–	..	3 17 0
E.M.I. (10/–) ..	6	8	26/6	–1/–	3 0 5
Elec.Construction	10	12½	50/–	..	5 0 0
Enfield Cable Ord.	12½	12½	58/–	..	4 6 2
English Electric..	10	10	48/–	..	4 3 4
EnsignLamps(5/–)	25	25	22/6	..	5 11 1
Ericsson Tel. (5/–)	22*	20*	52/–	..	1 18 6
Ever Ready (5/–)	40	40	39/6	–6d.	5 1 3
Falk Stadelmann	7½	7½	32/–	..	4 13 9
Ferranti Pref. ..	7	7	29/6	..	4 15 0
G.E.C. : Pref. ..	6½	6½	32/–	..	4 1 3
„ Ord. ..	17½	17½	91/–	..	3 17 0
Greenwood&Batley	15	15	42/6	..	7 1 2
HallTelephone(10/–)	12½	12½	25/9	..	4 17 0
Henley's (5/–) ..	20	20	25/3xd	+3d.	3 19 3
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	17½	62/–xd	+6d.	5 13 0
India Rubber Pref.	5½	5½	21/6	..	5 . 4
Intl. Combustion	30	30	6½	..	4 16 0
Johnson & Phillips	15	15	69/6	..	4 6 4
LancashireDynamo	20	22½	92/9	..	4 17 0
Laurence,Scott(5/–)	15	12½	11/6	..	5 8 8
London Elec.Wire	7½	7½	32/6	..	4 12 3
Mather & Platt ..	10	10	51/3	–1/8	3 18 9
Metal Industries(B)	5	8	45/–	..	3 11 2
Met. Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5½	..	3 18 0
Pye Deferred (5/–)	25	25	25/–	..	5 0 0
Revo (10/–) ..	17½	17½	40/–	..	4 7 6
Reyrolle ..	12½	12½	70/–	..	3 11 5
Siemens Ord. ..	7½	7½	34/9	–6d.	4 6 4
Strand Elec. (5/–)	7½	10	7/9	..	6 9 0
Switchgear&Cowans (5/–) ..	10	20	18/–	..	5 11 1
T.C.C. (10/–) ..	5	5	20/–	..	2 10 0
T.C. & M. ..	10	10	53/–	..	3 15 6
TelephoneMfg.(5/–)	9	9	11/6	–6d.	3 18 3
Thorn Elec. (5/–)	20	20	21/9	..	4 12 0
Tube Investments	20	20	93/–	..	4 6 2
Vactric (5/–) ..	Nil	Nil	13/9	..	—
Vickers (10/–) ..	10	10	18/9	–3d.	5 6 8
WalsallConduits(4/–)	55	55	45/–	..	4 17 9
Ward & Goldstone (5/–)	20	20	26/–	..	3 17 0
WestinghouseBrake	10	12½	67/3	..	3 14 1
West, Allen (5/–)	7½	7½	7/–	..	5 7 2

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page 558*)

resulted in an operating profit, as compared with a loss in the previous year. The price of the shares holds its recent rise to 7s. 9d., around which figure a fair amount of business is being transacted.

Tillings

The Thomas Tilling Company has given notice that it intends to pay off its 5 per cent. debenture stock at 100 on January 3rd next. Of this stock there is £361,111 in issue, part of the original £500,000 which was offered at 88⅞ about twenty years ago. The company has the right to repay it upon giving three months' notice any time after October, 1943. The original holders have done extremely well out of the investment, just as holders of Thomas Tilling shares have also seen a very substantial appreciation in the value of their capital. This repayment makes one more example of the readiness of industrial and other companies to reduce standing charges that arise from interest on loan capital. The process goes on so continually that before long there will be few companies left that have not taken advantage of the cheap-money policy.

Repayment of the debenture stock serves to fortify the position of Thomas Tilling shares, and the price at 58s. is 1s. up. The yield on the basis of the present-paid 10 per cent. dividend is a gilt-edged £3 9s. per cent. implying the likelihood of an increased distribution sooner or later.

Argentina and Brazil

The Finance Mission to Argentina, which has in hand the discussion with Argentine authorities of matters concerning the British-controlled railways in the Republic, has already got to work and expectations formed of a favourable outcome have been reflected in advances in Argentine railway and industrial issues. There was not much backing to the movement, however, and prices fell away, leaving Anglo-Argentine Tramways practically unchanged on the week.

The Brazilian financial position is still the subject of considerable discussion, and for the time being Brazilians are under a cloud. After their rise to 31¼ on the increase in the dividend, Brazilian Tractions have come back to 29¼ xd., at which the supporters of the shares claim that they make a healthy speculative investment, regarded as a post-war prospect.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT.-GES. für Technische Studien.—"Method for the regulation of output of thermal power plants." 17522/42. December 10th, 1941. (556410.)

A. Anderson and Anderson, Boyes & Co. Ltd.—"Mining machines." Cognate applications 4951/42 and 2025/43. April 15th, 1942. (556335.)

Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker.—"Electrical signalling systems." 764/43. March 26th, 1942. (Divided out of 551187.) (556326.)

B. G. (London), Ltd. (trading as Dulcie Co.), W. Barr and M. E. Angel.—"Combined radio and telephone device." 8731. June 25th, 1942. (556404.)

British Thomson-Houston Co., Ltd.—"Electron lenses." 9058/42. July 2nd, 1941. (556372.) "Lead-in arrangement for electric discharge devices." 11569/42. August 26th, 1941. (556377.) "Dynamo electric machines." 3710/42. March 20th, 1941. (556397.)

A. A. Collins.—"Selective shaft positioning apparatus." 4099. March 27th, 1942. (556363). "Motor control system." 8578/43. March 27th, 1942. (Divided out of 556363.) (556388.)

Dictaphone Corporation.—"Shielded amplifier reversing switch." 18395/42. December 27th, 1941. (556413.)

B. Erber.—"Electronic valves." (Cognate applications 1080/42 and 9456/42.) January 26th, 1942. (556305.)

F. E. Gill and Davenport Engineering Co., Ltd.—"Water cooling towers or like structures." 8773. June 26th, 1942. (556291.)

J. N. M. Howells.—"Television system." 4085. March 27th, 1942. (556320.)

C. C. S. LeClair and Tecalemit, Ltd.—"Oil filtration." 1021. January 24th, 1942. (556304.)

Lodge Plugs, Ltd., B. Hopps and C. J. Smithells.—"Sparking Plugs." 4137. March 28th, 1942. (556330.)

Marconi's Wireless Telegraph Co., Ltd., and G. N. Dyson.—"Method of locating electrodes within an envelope." 3918. March 24th, 1942. (556280.)

T. A. G. Margary.—"Means for recording the frequency of alternating electric current supply." 7895. June 10th, 1942. (556344.)

Maschinenfabrik Oerlikon.—"Air cooling arrangement for rotor windings of electric machines, especially turbo-generators." 1367/42. February 8th, 1941. (556327.)

L. G. Morten and J. F. O'Brien.—"Electricity conductor unit." 1131. January 27th, 1942. (556359.)

F. Nolten.—"Apparatus for winding electromotor or dynamo armatures." 6007. May 5th, 1942. (556368.)

Precision Developments Co., Ltd., and G. Olah.—"Electrical follow-up mechanism." 5727. April 29th, 1942. (556287.) "Contact arrangements applicable to electrical follow-up switches." 5728. April 29th, 1942. (556288.)

Rediffusion, Ltd., and P. Adorjan.—"High frequency electric heating apparatus." 10305. July 23rd, 1942. (556292.)

E. H. Roberts.—"Electric welding apparatus." 7993. June 11th, 1942. (Addition to 544363.) (556345.)

Standard Telephones & Cables, Ltd.—"Facsimile system." 4155/42. October 31st, 1940. (556331.) "Regenerative telegraph repeater." 7600/42. February 25th, 1941. (556340.) "Wiring of terminal banks." 18320/42. February 5th, 1942. (556412.) "Combined service meter and cut-off relay for telecommunication systems." 773/43. January 19th, 1942. (556417.)

Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.).—"Speech transmission system." 6997. May 22nd, 1942. (556369.)

Standard Telephones & Cables, Ltd., and J. D. Holland.—"Radio receivers." 4064. March 27th, 1942. (556319.)

Standard Telephones & Cables, Ltd., and A. J. Maddock.—"Antenna systems." 4133. March 27th, 1942. (556324.)

B. F. Sturtevant Co.—"Centrifugal fans." 11121/42. September 26th, 1941. (556375.)

Westinghouse Brake & Signal Co., Ltd., L. E. Thompson and A. Jenkins.—"Alternating electric current rectifiers of the selenium type." 3955. March 25th, 1942. (556310.)

Westinghouse Electric International Co.—"Electric measuring instruments." 7604/42. May 20th, 1941. (556341.)

York Shipley Ltd. (York Ice Machinery Corporation).—"Evaporators." 13465. September 24th, 1942. (556382.)

Amended Specifications Published

545814. Express Lift Co., Ltd., and another.—"Mechanical power transmission apparatus for lift systems."

548218. Marconi's Wireless Telegraph Co., Ltd.—"Aerial tuning systems."

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month of October 13th:—

VENTIFLEX. No. 624,610. Class 9. Insulated electric flexible conductors.—The Morgan Crucible Co., Ltd., Battersea Church Road, London, S.W.11.

ULTRON. No. 623,251 and ULTRONIC. No. 623,252. Class 10. Electric high frequency apparatus for medical or surgical purposes.—Ultra Electric, Ltd., Ultra Works, Western Avenue, Acton, London, W.3. To be associated with No. 622,438 (3401) ix and others.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Macclesfield.—November 17th. Electricity Department. 11-kV switchgear. (October 15th.)

Manchester.—November 5th. Electricity Department. 10,000-kVA transformer. (See this issue.).

Orders Placed

Barrow-in-Furness.—Electricity Committee. Accepted. 500-kVA transformer (£442), 300-kVA transformer (£317), and 50-kVA transformer (£100).—British Electric Transformer Co.

Blackpool.—Electricity Committee. Accepted. Modification of 6·6-kV switchgear.—G.E.C.

Glasgow.—Electricity Committee. Accepted. Two 6,000-kVA transformers (£9,348).—Bruce Peebles & Co. Six 400-kVA transformers.—British Electric Transformer Co.; Bruce Peebles & Co.

Lichfield.—Finance Committee. Accepted. Loud speaker equipment for Guildhall.—Standard Telephones & Cables.

London. — ISLINGTON. — Works Committee. Accepted. Electrically-driven air compressor (£146).—Tecalemit.

Newcastle-on-Tyne.—City Council. Accepted. Electrical repairs to Corporation houses (£150).—R. H. Paterson.

Radcliffe.—Electricity Committee. Accepted. Three sets of current transformers on switch panels at a substation.—Switchgear & Cowans.

Sunderland.—Corporation. Accepted. Alterations to the existing feed systems on the Nos. 2 and 3 turbo-alternators at the electricity works (£3,220).—Richardsons Westgarth & Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bolton.—Works additions; W. Townson & Sons, Ltd.

Restaurant, Moor Lane, and bungalows, Aintree Road; borough engineer.

Bootle.—Additions, sanatorium (£1,230); borough engineer.

Chelmsford.—Six shelters at Trinity Road Schools and two at Victoria Schools; V. J. Willis, borough engineer, Municipal Offices, Chelmsford.

Essex.—School kitchens (£1,500), A.R.P. buildings at Barking (£4,300) and water softening plant, etc., at Brentwood Mental Hospital (£1,700 and boiler works £5,992); county architect, Chelmsford.

Felling-on-Tyne.—School canteens; U.D.C. architect.

Finchley.—Civic restaurant, Falloden Way; P. T. Harrison, borough engineer, Regent's Park Road, N.3.

Gateshead.—Rebuilding and extension of warehouse for Binns & Co., Ltd.; Cackett, Burns, Dick & McKellar, Ellison Place, Newcastle-on-Tyne.

Hull.—Stores, Victoria Street; Wm. Jackson & Sons, Ltd.

Ilkeston.—Nursery, Sudbury Park; borough engineer.

Kendal.—School canteens; borough engineer.

Lancashire.—Additions to Grammar School, Audenshaw; L. Evans, county architect, County Buildings, Fishergate Hill, Preston.

Leeds.—Baptist Church, junction of King Lane and Stonegate Road; secretary, Yorkshire Association of Baptist Churches, Leeds.

London.—Buildings for fire pumps (£3,500); L.C.C. architect.

Mansfield.—School kitchen, Moor Lane Council School, with electric cooking equipment; W. Thompson, borough surveyor, Municipal Buildings.

Newcastle-on-Tyne.—Erection of five more wartime nurseries for the City Council (£13,000). Contractors: R. M. Chamberlain & Co., Ltd., Gateshead; J. Sutton & Sons, Gateshead; and J. & W. Lowry, Newcastle.

Provision of sculleries at schools. Contractors: Stephen Fenwick & Co., Ltd., Newcastle, Elliott Bros., Newcastle, and the Anglo-Scottish Construction Co., Ltd., Newcastle.

Newcastle-under-Lyme. — Community Hall; secretary, Tenants' Association, Bradwell Housing Estate.

Newport (I. o. W.).—Restaurant, Quay Street; borough engineer.

North Riding.—Canteens in schools at Leyburn and Startforth, and school dinner centres at Stillington and Crayke; county architect, County Hall, Northallerton.

Preston.—Private patients' home, Preston Royal Infirmary; general superintendent and secretary.

Rotherham.—Switch house; British Electro Metallurgical Co., Ltd.

Extensions to laundry at Alma Road Institution; V. Turner, borough engineer, Municipal Buildings.

Staffordshire.—Youth centre at Darlaston, with heating, lighting, etc.; A. C. H. Stillman, county education architect, County Buildings, Stafford.

Sunderland.—Adaptation of Burlington Buildings as central kitchen under the school meals plan; borough engineer.

Tividale.—Church Hall, Ashleigh Road; Bishop of Lichfield's Campaign Office, Diocesan House, Lichfield, Staffs.

Wallasey.—Central school kitchen; director of education.

Wallsend.—N.F.S. station, Elton Street; Divisional Officer Andrews, N.F.S., Whitley Bay, Northumberland.